HANDBOOK

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OF

SUBSISTENCE STORES.

COMPILED UNDER THE DIRECTION OF THE COMMISSARY GENERAL FROM MONOGRAPHS WRITTEN BY OFFICERS OF THE SUBSISTENCE DEPARTMENT.

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CONTENTS.

APPENDIX.

HANDBOOK OF SUBSISTENCE STORES.

APPLES, CANNED.

For canning purposes, moderately tart apples are better than sweet ones. Canned sweet apples usually have little flavor, are insipid, and not desirable for Army use.

What are known as winter varieties of apples are better for canning than the earlier varieties. Good apples are put up in Maine, Michigan, Missouri, and other States, but most extensively in the State of New York; and Western New York apples, on account of their firmness and flavor, are considered the best for canning.

There are two grades of New York canned apples, viz: "Standards" and "Seconds." The "Standards" are made from selected Greenings or Baldwins; the "Seconds" from irregular pieces of Greenings or Baldwins, and from apples of other varieties. The "Standards" grade may be distinguished by the even and regular appearance of the fruit, and the tartness, firmness, and flavor peculiar to the Greening and Baldwin varieties of apples.

Apples to be canned are, after careful selection, peeled, cored, and quartered by machinery; then dropped into tubs of cold water to preserve their color; from these they are packed in cans, each containing as much fruit as it will hold, and the interstices filled with water. The cans are then capped and processed.

Canned apples are generally put up in either 3-pound or 1-gallon cans.

Upon opening a can of good apples, the fruit appears bright (tart) and free from bruises or discolored pieces. Unnatural whiteness indicates that it has been bleached with sulphur.

Canned apples that have been imperfectly processed, or damaged from any cause, ferment quickly, a condition discovered by the swelling of the cans. Cans that have fermented

are sometimes reprocessed. Apples or other fruits that have been reprocessed should not be purchased for Army use.

Canned apples are packed in cases containing six or twelve 1-gallon cans, or twenty-four 3-pound cans.

APPLES, EVAPORATED.

Evaporated apples are cured by the Alden process.

Slightly tart, sound, fresh apples, without bruises, are required for making good evaporated apples.

The peeled, cored, and sliced fresh apples are subjected for a sufficient time to the action of a strong current of hot, dry air, whereby a large proportion of their water is evaporated and a very considerable proportion of their starch converted into sugar.

The effect of the process is to preserve the sliced apples by desiccation and saccharization, conjointly.

Evaporated apples are put up in 50-pound boxes.

APRICOTS, CANNED.

Apricots, for canning, should be ripe on both sides, but still firm. If they are not ripe, the canned product will not have the proper flavor; if too ripe, it will become mushy while being processed.

After the cans are filled, a quantity of the best refined cane sugar, sufficient to neutralize the natural acidity of the fruit, is added.

In processing, some packers use the open-vent method, *i. e.*, the method of closing the can and leaving a slight puncture for the escape of the steam and air, and afterwards closing the puncture with solder. A better and more cleanly method is to hermetically seal the can, and then, after processing it for about ten or twelve minutes, puncture and resolder it immediately. The sirup should have a good body and a fruity flavor, and the can should be well filled with fruit.

If the cans are processed too much, their contents become soft and will not stand transportation; if too little, their contents are apt to be hard and deficient in flavor.

Canned apricots, peaches, and pears, properly put up, improve with age until they have been packed three years. None of these fruits should be kept in an opened can.

If unrefined sugar is used in canning apricots, it injures their taste and appearance; and if glucose is used, it improves the appearance but adds nothing to the taste and detracts from the keeping qualities.

Apricots are packed for the trade in 2½ and 3 pound cans, twenty-four to the case. The 2½-pound cans only are purchased for Army use.

BACON.

Bacon is the flesh of the hog cured or preserved by salting and smoking.

The dressed hogs, after hanging in the cooling room until they are thoroughly cooled, are taken down and cut, according to the rules of the trade, into pieces for making the classes of meat required. The pieces destined for making bacon are well rubbed with salt and placed in layers, in bulk, in a room kept at a temperature of from 36° to 40° F., and allowed to remain in bulk during a period of from fifty to eighty days, according to their weight, during which time they are resalted three or four times, or more frequently, if necessary. The pieces are then taken out of bulk, and after being washed, are hung up in the smokehouse and allowed to drain for ten or twelve hours. They are then ready to be smoked.

In smoking bacon, the temperature of the smokehouse should never be more than 140° F.—the effect of a greater heat is to coagulate the albumen of the meat and impair its solubility and nutritive value. In smoking bacon, it should go through what is called "the sweat" (which means a drying), which contributes largely to its preservation. Its preservation is, also, partly promoted by the absorption of antiseptics (pyroligneous acid and creosote) from the smoke generated in the slow combustion of the wood fuel.

Well-cured bacon is dry and firm; poorly-cured bacon is soft and watery, and will not keep, unless the water is driven off by resmoking. When bacon is not properly smoked, but is colored only, by the smoke of bark, it is still moist, and, on cutting into it, the moisture appears in the incision.

The best kinds of wood for smoking are well-seasoned hickory and rock maple—preferably the former. It usually

takes from ten to fourteen days to smoke bacon. By the use of tan bark it can be fraudulently colored in four days.

Bacon is classified according to cuts and manner of trimming, as follows, viz: Short-clear sides, short-rib sides, long-clear sides, Cumberland sides, hams, shoulders, etc. Sugar-cured hams and breakfast bacon are fancy kinds of bacon.

The kind of bacon most generally purchased for issue to the Army is short-clear sides.

To make short-clear sides, the backbone, breastbone, and ribs are taken out, and the hench bone sawed down smooth and even with the face of the side; the feather of the blade bone is not taken out, the edges are left smooth, and the side is not back-strapped or flanked.

The proper curing of bacon depends, of course, on the size of the pieces. Ordinarily, it will take sixty days at least to cure, smoke, and dry it properly; although it can be hastened, no doubt, by rehandling every six days. By this is meant that the green meat should have salt rubbed into each piece that often, and then be repiled.

Winter-cured bacon (that packed between November 1 and March 1), which is most generally purchased by the Subsistence Department, is more economical, undergoes less shrinkage, will stand transportation better in hot weather, has a drier appearance, and is drier and better than summer-cured bacon.

The inspector "tries" each piece of meat as it is placed on the inspecting bench, shoulder end toward him, with a steel trier, which he inserts into the piece in three or four places, in the shoulder end near the feather bone, and in the flank and the rump end, smelling the trier after each insertion, and rejecting all pieces that are unsound, sour, or that have any odor except that of sweet, sound bacon, or that do not comply with the rules relative to cuts and manner of trimming.

Bacon should remain in the smokehouse several days after smoking, so that it may be well dried out.

PACKING.—Bacon for Army use is packed in crates, and should be both cool and dry when packed. It should be weighed, net, on a scale that has been previously tested and balanced, and should be placed on the scale carefully, so as to

prevent throwing it out of adjustment by jarring, and avoid consequent inaccuracies in weights. Each piece is covered with cotton cloth. The cloth and crates are included in the tare. The weights of pieces contracted for are restricted to not less than 25 nor more than 50 pounds; it being distinctly understood that the weights of pieces are not to be averaged, but that no piece shall weigh less than 25 nor more than 50 pounds. With few exceptions, this rule is enforced, although occasionally a few pieces may weigh 22 or 53 pounds (it being sometimes difficult to obtain a sufficient quantity within the limit), the exceptions being in cases requiring the making of shipments admitting of no delay. Most of the packers guarantee weights, but they are, nevertheless, verified by the inspector. The number and kinds of pieces contained in each package are required to be marked thereon.

The laws of the United States now require all pork and bacon intended for exportation to be inspected at the place of packing or exportation. This duty is placed upon the Secretary of Agriculture.

STORAGE.—The storehouse should, at all times, be kept as cool, dark, and dry as possible. The storeroom containing bacon should have double doors, the inner one of iron (grates) and the outer one of solid wood, which latter, during clear and warm weather, should be opened after sunset and closed before sunrise, to admit the cool air at night and keep out the heated air by day. If the bacon is in a cellar where it is not convenient to arrange it as described above, the windows should be provided with open grates and close shutters, and, as far as possible, managed as prescribed for double doors, taking special care to have the cellar dry and well ventilated.

Bacon has been stored in racks. To store bacon in this manner, it is taken from the packages as soon as received; it is then placed, on edge, upright in the rack, the soft (the inner) portions of the first and second pieces, and of each successive set of two pieces, being faced toward each other and pressed together. When one section of the rack is filled, it is advisable that wooden wedges be driven between each set of two sides, to press the soft inner portions thereof firmly together,

with a view to excluding, in summer, as far as possible, flies, dust and heated air, from the inner portions, and at the same time affording a small space for circulation of air between the backs of each set of two sides.

Bacon has, also, been stored in bins packed in salt. The bacon, in cotton-cloth covers, was placed in the bins and each piece covered with salt. It has also been put up for shipment to, and storage therein at, posts located in warm climates, in boxes, similarly packed in salt. It has been found, however, that while the salt preserves the bacon from putrefaction, it nevertheless has a very damaging effect on it, as the alkali therein slowly decomposes or eats up the fatty portion of the bacon, separating it from the rind in chunks. The packing of bacon in bins or boxes, with salt, is not therefore recommendable.

A few years ago at Fort Brown, Tex., it was observed that the damp climate caused the salt in which the bacon was packed in bins to become soft and liquescent, and trial was, therefore, made of packing it in charcoal instead of salt. The pieces were covered with cotton cloth and then placed in the bins, and the layers covered with not very finely crushed charcoal. The cotton-cloth covers became black, but they were removed, and the bacon washed off, before issue. The experiment was a success.

Bacon has, also, been stored by hanging it on hooks driven into the rafters or joists of the storage room.

The invention of the bacon crate, and its adoption by the Subsistence Department as its standard package for bacon, have, however, led to a new, simple, and efficient method of storage. The crate, being a ventilated package (a wooden box with slatted sides, top, and bottom), in addition to fulfilling the ordinary requirements of a package for handling and transporting bacon, is also well adapted to preserving it; and, therefore, bacon packed in crates should not, as a rule, be removed therefrom until it is issued. The crates of bacon, as put up by the packer, should be stored in a cool, dry place in tiers with passageways between them, in such a manner as to allow as free a circulation of air as possible among, around, and through them.

BACON, BREAKFAST.

The most desirable breakfast bacon is cut from small hogs, the original piece or belly weighing about 11 pounds; this is cut into three pieces which will weigh from 3¾ to 5 pounds each before canvasing. Heavy, fat, or thick pieces are not desirable—pieces about 1¼ inches thick and 3½ to 6 inches wide, which, when cut, show a streak of lean and a streak of fat, being preferable.

The curing of breakfast bacon in sweet pickle is very similar to the curing of hams, the former requiring, of course, less time than the latter; ordinarily from fifteen to twenty-five days is sufficient, owing to its lack of bone and, also, because of its small size as compared with hams; it should be smoked from two to four days.

The quality of breakfast bacon depends upon the quality of the meat from which it is made, the strength of the pickle, the length of time the meat remains in the pickle, and the slowness with which it is smoked.

Parchment paper and strong, close-woven burlap not painted, are preferable as coverings to yellow-washed canvas. Whenever practicable, breakfast bacon should be inspected before it is canvased and examined closely to see that the pieces were originally cut from light-weight bellies. It should be well smoked and dried out before covering.

In inspecting canvased bacon, a number of pieces are taken at random, and after the canvas is removed, are closely examined. In both cases the inspector should cut a few pieces in two to satisfy himself that it is properly cured.

The storage of breakfast bacon requires care and watchfulness; upon its receipt, the pieces should be removed at once from the crates and hung up in a cool, dry place, but *never in a cellar.* The room should be well ventilated; if in damp, hot weather it shows signs of mold, the pieces should be rubbed with a clean, dry brush.

Hams, breakfast bacon, shoulders, and dried beef are usually canvased for summer use, but during cold weather they are sold without a covering, which style is called "plain."

Meats are subject to mold, skippers, souring or tainting, and spotting.

MOLD. (See "Hams.")

Skippers can not be prevented, even with the greatest care; canvasing is always done in dark, cool rooms, so as to exclude the possibility of its being "stung" or having eggs deposited on it by a fly, and to these rooms the meats are removed direct and at once from the smokehouse; yet, in packing for transportation, a nail may tear the covering or the pieces may chafe against each other and cause a break in the covering, or any other accident may happen, which will give the ever-present fly a chance to deposit its eggs, which hatch out, according to circumstances, in from two to six days. Canvased meats should be examined upon receipt, and should the yellow wash be rubbed off the coverings, or any torn places be found therein, or the seams be strained or any damage by nails have occurred, and no skippers have made their appearance, the coverings should be repaired, and the meats set aside for the first sales.

Breakfast bacon for Army use is put up in crates containing about 100 pounds net. The number and kind of pieces in each package, the gross and net weights and tare, the packer's name and location, and the date of packing, should be marked on each package.

BAKING POWDER.

Baking powder is used as a substitute for yeast in making bread.

It is composed of an acid ingredient, an alkali ingredient, and a neutral ingredient or "filling." The office of the filling, which is generally starch, is to keep the acid and alkali ingredients apart, and thereby preserve their chemical neutrality until the baking powder is required for use.

In the best kind of baking powder, the only kind that will be treated of in this article, the acid ingredient is potassium bitartrate (cream of tartar); the alkali, sodium bicarbonate (soda); and the neutral, cornstarch. The proper proportions of the acid and alkali ingredients are, of course, those in which they chemically combine with each other, viz, two of the former to one of the latter. The proportion of filling has

an important influence on the keeping quality and strength of baking powder. Analyses of and experiments with many samples, made under the direction of W. H. Wiley, chemist, and Profs. H. A. Webber and H. G. Cornwall, go to prove that when new, and everything else is equal, baking powders containing a small proportion of filling have greater gas efficiency or strength than those containing a large proportion; but that the former deteriorate very rapidly, and after being kept on hand a short time, have less gas efficiency than the latter. Professor Prescott considers that the proportion of filling should be from 13 to 18 per cent. When the proportion of filling exceeds 20 per cent the excess should be considered as adulteration.

When baking powder is mixed with flour and water added, and the mixture made into dough, the acid and alkali ingredients are dissolved by the water and thereby brought into such intimate contact with each other that a chemical reaction is set up between them within the dough, resulting in their decomposition and the formation of a new compound, potassium-sodium tartrate (Rochelle salt) and the evolution of carbon dioxide (carbonic-acid gas). The Rochelle salt amounts to 77.2 per cent of the combined weights of the acid and alkali ingredients.

Of all the residue left in the bread made with different kinds of baking powder, that left when the acid ingredient is cream of tartar is the least harmful, and that when it is alum, the most harmful.

It has been found by experience that cream-of-tartar baking powder has greater gas efficiency, and is most uniform in its action, when its ingredients are proportioned about as follows, viz:

	Per cent.
Potassium bitartrate	54
Sodium bicarbonate	27
Cornstarch	19
Total	100

Baking powder made according to this formula will, upon the decomposition of its acid and alkali ingredients, yield to

the dough the following substances and proportions thereof, viz:

	Per cent.
Carbonic-acid gas	12
Rochelle salt	69
Cornstarch	19
Total	100

The carbonic-acid gas, after performing the office of vesiculating and raising the dough, escapes in the process of baking; the Rochelle salt remains in the bread, as a foreign substance; and the starch is, in the process of making the dough, incorporated with the flour and, of course, becomes a part of the bread.

A baking powder made at home according to the following formula, which is easily remembered, will keep as well, give as good results, and be much cheaper than any of the popular brands, viz:

	Ozs.
Cream of tartar	8
Soda	4
Cornstarch	4
Total	16

The cream of tartar and soda, being chemicals, should, to insure purity, be procured from a druggist; the cornstarch may be procured from a grocer. The ingredients should be well mixed by hand, in a tray, and the process completed by passing the mixture through a sieve.

For Army use, baking powder should be put up in ½-pound tin cans, three dozen in a case; or 1-pound tin cans, one dozen or two dozen in a case, as may be required.

Baking powder should be stored in the original cases, in a cool, dry place.

A few tests for cream-of-tartar baking powder and such adulterations as one might expect to find therein, are subjoined.

Solution Tests.—Pure cream-of-tartar baking powder will dissolve in boiling water and will show but a slight trace of cloudiness when tested for lime. It should give reactions for tartaric acid and potash, and be free from alum, ammonium

salts in any great quantity, phosphates, and sulphates. If the filling is flour, ammonia in small quantity will be found.

TARTARIC-ACID TEST.—Put about a teaspoonful of the baking powder into a beaker, add ammonia water, agitate, half fill a test tube, add a crystal of nitrate of silver, and heat slowly. The pure cream of tartar, if tried alone, will produce a silver mirror in the tube and darken its bottom; whereas, if tried in the powder, it will give a dark, powdered deposit, dimly glossy.

TEST FOR POTASSIUM.—Make a little of the baking powder into a paste, take up a small part of the paste in the loop of a platinum wire, hold it in the flame of a Bunsen burner and observe it through a piece of cobalt glass; a violet color indicates the presence of potassium.

LIME TEST.—Make a solution of the baking powder with water, filter, half fill a test tube, add ammonia until alkaline, then add ammonium oxalate; if lime is present, it will be precipitated as a white powder. This will show that the cream of tartar was not of standard quality.

TEST FOR ALUM.—Half fill a test tube, as before, add a few drops of freshly-prepared logwood solution, acidify with acetic acid; a yellow color proves its absence, and a bluish purple-red denotes its presence.

TEST FOR AMMONIUM SALTS.—Mix a small portion of the powder in a test tube with an equal volume of slaked lime and a little water, then heat, and the ammonia will be recognized by the smell. This might come from a flour filling.

TEST FOR PHOSPHATES.—Make up a solution, add a few drops to a test tube containing molybdate of ammonium, and there will be a fine, yellow precipitate formed in the tube if phosphates are present.

TEST FOR SULPHATES.—Make up a solution in water, acidify with hydrochloric acid, add barium chloride; a white precipitate shows the presence of sulphates.

DETERMINATION OF STARCH.—Put about a gram of the baking powder into a beaker, cover with water, let it digest until action has ceased, filter and wash, remove residue into a flat-bottomed platinum crucible by means of the wash bottle, let it settle, remove supernatant water with pipette, evaporate at 212° F., until constant; cool and weigh. The residue should then be incinerated, and the weight of the ash deducted; this remainder divided by the weight of the powder used gives the percentage of filling. If not convenient to incinerate, deduct 1.6 per cent from residue and divide by weight of powder used.

DETERMINATION OF CARBONIC ACID.—The usual method is by the absorption of the gas in soda-lime tubes previously weighed, but this is not applicable outside of a laboratory; nor is it necessary, as an experienced purchaser can readily tell by the following practicable and simple way: Having ascertained that the acid ingredient used is cream of tartar, that the powder is clean, unfermenting, and without rancid odor, half fill as many glasses with clear, tepid water as there are samples, and put a teaspoonful in each glass, stirring it rapidly in the water, and observe the relative action. It would be well to make up a powder as follows: Eight parts cream of tartar, four parts bicarbonate of soda, and three parts flour; thoroughly mix, and take a teaspoonful of it as a standard. This is quick, determinative, and practical, showing relative merits of samples at a glance.

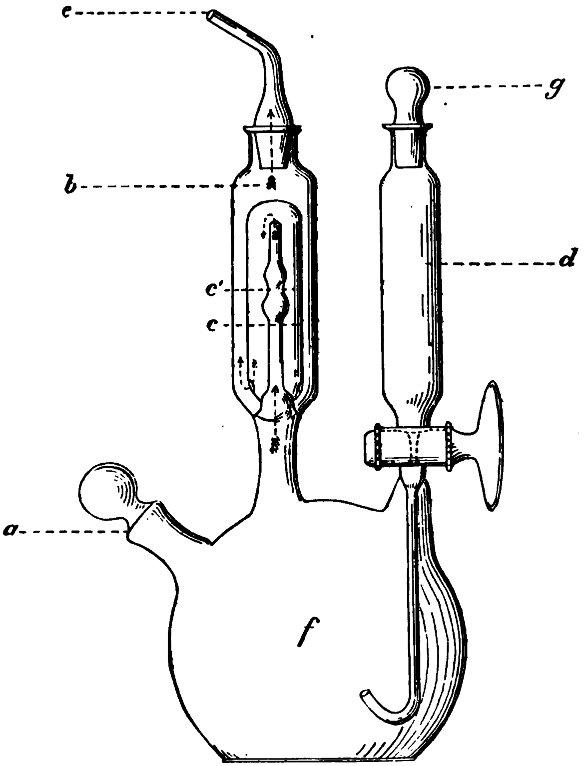
An exhaustive and, in skillful hands, a really simple way is the following:

Referring to the apparatus delineated in the following figure, weigh in at aperture *a* from one to three grams of the baking powder; tube *b* should be filled with sulphuric acid to a point between *c* and *c'*, for the purpose of drying the gas as it escapes; tube *d* is to be filled three-fourths full of hydrochloric acid. Weigh the charged apparatus and admit the hydrochloric acid gradually to the powder by means of a stopcock; the liberated gas passing through the sulphuric acid is dried and escapes through *b*. The last particles of gas are drawn off by gently warming the bottle, and all may be removed by opening the stopper *g* and sucking at *e*. Now

cool and reweigh the apparatus; the loss in weight is the carbonic acid, and its percentage may be noted as follows:

	Grams.
Weight of baking powder taken	2
Weight of baking powder and apparatus	52
Weight after drawing off CO_2	51.7
Weight of CO_2 in 2 grams baking powder	0.3

$$\frac{0.3}{2} \times 100 = 15 \text{ per cent.}$$



After the apparatus is charged, it only takes a few minutes to make a determination.

The methods herein given for testing baking powder are more formidable in appearance than in practice, but they are quite conclusive enough for all practical purposes.

BASINS, HAND.

The hand basin supplied to the Army is made of stamped metal, XX tin, measuring 14 inches in diameter at the top and 7 inches at the base. It is 3¼ inches deep, with a capacity of 1 gallon when filled to the brim. It weighs about 12 ounces.

The tinning should be of uniform thickness, and should not come off easily.

BEANS.

Beans are the seeds of certain leguminous plants, and are used for food in nearly every part of the habitable globe; they are highly nutritious, containing about 84 per cent of nutritious matter—wheat averaging but 74 per cent. They are, however, deficient in carbonaceous constituents, and for this reason are almost invariably eaten with either bacon or pork, which are rich in carbon.

There are many varieties of beans, differing in shape, size, and color. The best variety for Army use is the small white bean, generally known as the "Navy bean," which is rather flat, inclined to squareness at the ends, and brittle under the teeth; this should not be confounded with the "pea bean," which is more nearly round, not as long, and has not as bright a skin.

Other beans are better for boiling, and still others will bake as well, and nearly all cook more quickly, when fresh, than the small white beans; but none of them have such a hard, "varnished" skin, or are so little liable to attacks by weevils, or to absorb moisture. With ordinary care, they remain hard, dry, and brittle until placed in water.

Beans should be plump, free from sticks and dirt, and, especially, weevils.

For close inspection, empty a few sacks on a paulin.

A popular variety of beans, grown and used extensively in Central America, and in Mexico and New Mexico, is the *frijole* or Mexican bean. It is of medium size (larger than the Navy

bean) and of a pinkish-brown color, turning to a chocolate-brown when cooked. As prepared in Mexico, the *frijole* is a very savory and strong food. A common method of cooking *frijoles* is to boil them very slowly and for a long time in soft water, until they become perfectly tender; the water is then strained off and the *frijoles* simmered with a little lard or beef suet, and crushed chile pods; afterwards flavored with onions or garlic, and salted to suit the taste. Baked with pork, in ordinary New England style, they make a most palatable and strengthening food. While a small bean is best, size is not so important as uniformity in size, and all not uniform in size should be rejected, as they do not cook evenly. They should always be purchased of the latest crop, if thoroughly dry. If they are old, they require a long soaking before boiling. The new crop is hardly dry enough for acceptance, except for immediate consumption, until about the 1st of November. New dried beans can generally be known by their being soft when bitten through. The tendency of beans is to absorb moisture, and if sacked in a damp condition they are likely to become musty. Beans should be taken out of the sacks occasionally and dried to prevent them from becoming musty, damp, or moldy. Care must be taken to promptly separate unsound beans from the sound. In large wholesale houses there are machines for this purpose. Weevils and worms can be removed by exposing the beans to the sun, or by subjecting them to a low heat in a bake oven.

Musty beans should not be issued, but should be condemned without attempting to renovate them.

Beans should not be stored near other stores that are liable to be affected with weevils.

Beans are used in the Army in the dried form, and also in the canned form with a small piece of pork, technically called "baked beans."

Beans ship best in sacks. For Army use, new crop, hand-picked, white beans, of uniform size, should be purchased.

By kiln-drying is meant a gradual drying in an oven or kiln at a temperature of about 120° F., to remove the water slowly without scalding or burning the beans.

Beans, hominy, and other large-grained articles are easily kept by storing in dry places, in good packages, with frequent rolling or repiling.

The best general rule to prevent spoiling of farinaceous goods is to keep them in well-ventilated, dry places, and to move them frequently to change the exposure, of the packages.

The new beans come into market about November, but during December and January they improve in condition by drying out; the extent of the crop becomes known, and prices are, thereafter, more settled.

BEANS, BAKED, CANNED.

In order to produce a good article, good beans must be used. The quality of dried beans varies greatly, and, correspondingly, the price; it is therefore possible to put up canned baked beans varying greatly in quality and price. The most careful packers buy only the best dried beans, after having tested their baking qualities. They should be hand-picked and not too new.

The process of making canned baked beans is as follows: The dried beans are washed and the water thrown away; then soaked over night and the water thrown away; they are then parboiled until soft, and the water thrown away. If the beans are to be put up with pork, as they should be for Army use, the pork is weighed out, 1¼ ounces for 1-pound cans, 2½ ounces for 2-pound cans, and 4 ounces for 3-pound cans. The pork is laid in the bottom of the cans and the proper quantity of beans put in; then a certain amount of a cooked solution of salt, bicarbonate of soda, and molasses, and sometimes other ingredients. The bicarbonate of soda is used to kill the gas in the beans. The cans are then sealed and boiled in an open bath for half an hour; then punctured to let out the steam and air; and then sealed again and put into a retort and cooked for about an hour at a temperature of about 245° F.

There is no special season for putting up canned baked beans. Those put up before December should be old-crop beans, as the new-crop beans are then too soft. After canning

they should be kept in a dry place, not warm. Baked beans not properly packed will sour, and, in canning, should for the same reason be not carried over night incompletely canned.

The three sizes packed for the trade are the 1-pound, 2-pound, and 3-pound cans. For Army use, the 1-pound and 3-pound cans are the authorized sizes—the former being used only for equalizing quantities issued on ration returns.

BEEF, CANNED.

CANNED CORNED BEEF.—Canned corned beef is made from the plate, brisket, flank, and chuck pieces, but chiefly from the latter. The meat is cured in a pickle for from fifteen to twenty days; it is then put into a vat and boiled for about forty minutes; it is then taken out of the vat, the sinews removed, extra fat, etc., cut off, and pressed into the cans, in each of which a little beef jelly has been placed, and sometimes, if the beef is very lean, a little kidney fat, and the cans weighed—allowance being made in weighing for "blowing off" when the cans are vented. The cans are then sealed and processed.

The methods of processing vary a little with different packers, but all are similar and accomplish the same purpose. By some the cans are submerged in boiling water; by others they are lowered into, and partly immersed in a chemical bath, which causes the cans to swell out or bulge. The steam and air are "blown off" through a puncture made in the cap of the can, which is immediately after closed with solder. When the process is finished and the cans cooled, they present that shrunken appearance which indicates that all the air has been expelled. Any can which does not present this appearance is thrown aside. The cans are then labeled and packed for shipment.

The quality of canned corned beef is determined by its appearance, which should be bright and lively; by its flavor, which should not be too salty; by its freedom from sinew and by its having a due proportion of fat, which, through the processing, has a gelatinous appearance on opening the can, and should conform to the shape of the meat and the can.

It is packed in cases containing, each, twenty-four of the 1-pound or 2-pound cans, twelve of the 4-pound or 6-pound cans, and six of the 14-pound cans.

Canned Fresh Beef.—This article, like canned corned beef, is made chiefly from chuck pieces.

The meat is boiled about forty minutes, after which it is trimmed, the pieces of sinew taken out, extra fat, etc., cut off, and then put into cans and weighed. A very little salt is put into each can with the meat. The cans are then sealed and processed; being, for this purpose, placed in a steam bath or retort, as it is termed, where they are allowed to remain from ten to thirty minutes, according to the size of the can, which, in addition to sterilizing the meat, has also the effect of imparting to it somewhat the flavor of roast beef.

The quality of canned fresh beef is determined by its appearance, flavor, freedom from sinew, etc., as in corned beef. Good canned fresh beef should have about the same appearance as the second cut in a well-cooked piece of roast beef, and be pleasant to both taste and smell.

Canned fresh beef is packed in cases containing, each, twenty-four 1-pound or 2-pound cans, or twelve 4-pound or 6-pound cans.

BEEF, SALT.

Salt beef is good only when new; after a year it becomes dry and tough, particularly if it is made of fresh beef of inferior quality.

Mess beef, to pass inspection, should be packed from the dressed carcasses of well-fattened cattle, weighing each about 600 pounds. One carcass, independently of the parts excluded, should make two barrels of mess beef. A barrel of mess beef is composed of six coarse pieces, and the balance of first-quality pieces; or of equal proportions of fore and hind quarter pieces. In all cases, the neck, shoulder clod, and shin are excluded from the fore quarter; and the shin from the hind quarter. In fore-quarter cuts, all in front of the navel line are coarse pieces, also the chuck ribs and the leather chuck. The navel end may or may not be coarse, depending upon the

quality of the carcass. All other cuts in the fore quarter are first-quality or prime pieces.

In the hind-quarter cuts, the thin end of the sirloin, the middle cut of the sirloin, and the thick end of the sirloin are first-quality or prime pieces; the thin flank may or may not be a first-quality piece. All other cuts of the hind quarter are coarse pieces.

The thick flank, cutting off with it a triangular piece from the leg round, makes the best cuts for dried beef. This is split once, making inner and outer cuts, the outer one being the best. The shoulder-of-mutton piece is made by cutting and "lifting" the fore shoulder.

After packing, from a large amount of beef, six coarse pieces to the barrel, and the balance of fine pieces, making mess beef, the remainder of the lot makes prime beef.

Beef should be cut square and smooth, into pieces of as nearly 8 pounds in weight as possible. The number of cuts will depend upon the weight and size of the quarter. After cutting the beef, instead of packing it into barrels from the block, it is preferable to place it into casks, with a little fine salt between the layers, and about 4 ounces of saltpeter to every 200 pounds of beef. The cask should then be filled up with brine and allowed to remain three or four days, or until the blood is completely soaked out. When the beef is taken out to be packed, the pickle should be allowed to drain off before weighing; 204 pounds to the barrel will then be enough; but if packed from the block (a bad method), 208 pounds will be necessary. If packed from the block, the bloody brine should be drawn off in from four to six days after packing, and the barrels filled up again with good, clean, strong, pure brine. In packing, the pieces should be placed on their edges, with salt between the layers, and the barrel should be finished with nice, smooth, first-quality pieces (plates and briskets, or standing ribs) and a good capping of salt. Saltpeter should not be used in any except the first brine. For repacking beef, if the old brine is sound, sweet, and free from bloody matter, it is best to use all, or, at least, the greater part of it. For testing the strength and quality of the brine, use an egg, etc., as directed in the article on "Pork."

There are great differences in the quality of mess beef, as sold in the market, arising from differences in age, weight, and kind of cattle slaughtered. With mess pork it is otherwise, as hogs are more uniform in size and weight.

For immediate issues to troops, corned beef answers exceedingly well. In large cities it can be procured in the market, though the cuts are usually irregular, and coarse pieces are frequently mixed with the lots by the butchers who have to dispose of the surplusage of such meats accumulating in their stalls.

It is very important that beef, as well as pork, should not be exposed to a summer sun. Oak barrels are much the best for beef, though white-ash barrels are sweeter and make nearly as strong packages as oak.

Salt beef is packed in barrels containing 200 pounds of beef each, or in half barrels containing 100 pounds each. The same care as is required in the storage, etc., of salt pork, should be taken in the storage, etc., of salt beef. It should be rolled frequently and never exposed to the sun.

BLACKING, SHOE.

There are various formulas for the manufacture of shoe blacking. The principal ingredients are ivory black or bone black, molasses or sugar, vinegar or beer bottoms, oil of vitriol, etc. The substitution of lampblack for ivory black makes a lower-priced product, but it is injurious to the leather.

Shoe blacking should be free from offensive odor, not injurious to the leather, and give a smooth polish.

It is packed in tin boxes of different sizes, designated No. 1, No. 2, etc., up to No. 5, and these are packed in cases of seventy-two of No. 1 and thirty-six of each of the other sizes.

It should be stored in a cool, dry place, and while in transportation should be kept cool.

BLUING.

Bluing, or soluble blue, is a powder manufactured at all seasons of the year, of yellow prussiate of potash and ferrocyanide of iron; this forms the strictly pure bluing, which has a very brilliant, velvety appearance.

When adulterated, bluing has a dull hue. Sugar, salt, bicarbonate of soda, starch, etc., are used to lessen its cost. The first three adulterants can be detected only by a chemical analysis. Starch, not being easily soluble, can be detected by placing a sample of the suspected bluing in water, when the starch, if present, will be precipitated.

The original packages are casks or barrels. For commercial purposes, it is repacked in packages of convenient size.

The best package for Army use is the 2-ounce dredge box, put up in cases containing from forty-eight to one hundred and forty-four boxes each.

Bluing should be stored in a dry place.

BROOMS, WHISK.

Whisk brooms are classified according to length and weight.

A 9-inch broom should be made of the best dwarf corn, strong and pliable, about 9 inches from neck to end, and with fine burl on the outside. It is held in shape by three ties of of strong waxed twine about ½ inch apart. The lower tie is about 2¾ inches from the neck. The broom must be perfectly solid at the middle tie, about 1 inch thick, 3¼ inches wide, and spread at the end to a width of about 6½ inches.

The upper end of the broom is fastened around a wooden handle ⅝ inch in diameter, with six strands of No. 20 tinned annealed wire nearest to the body of the broom, four strands at upper end of handle, and five strands between these two fastenings.

The end of the handle is covered with a tin cap. The brooms should be of uniform weight, about three to a pound, and should be perfectly solid at the shoulder and where they are sewed; the cross stitches should not be over ⅜ inch apart, and the wire should be wound tightly around the corn and handle.

The best broom corn for making whisk brooms is of pea-green color, strong and pliable, clean and free from seed, and well filled out toward the end. Red-tipped or crooked broom corn should not be used.

The 8-inch brooms have but two ties of twine, ½ inch apart, the lower one 2½ inches from the neck.

The shorter brooms have but one tie of twine, and usually are not very serviceable—their fancy handles of bone, etc., becoming loose after a little use.

BRUSHES, BLACKING.

Blacking brushes, of three kinds or styles, officially designated as No. 1, No. 2, and No. 3, are furnished for the use of the Army.

No. 1 is a dauber and polisher combined, and has a handle. The block of the dauber is made of whitewood with a veneering of mahogany on the back. It is circular in form and 3 inches in diameter. The tufts of bristles are in concentric circular rows and are cemented into holes in the block. The bristles are 1¼ inches long, measuring from the face of the block. The block of the polisher is also made of whitewood and has a veneering of mahogany on the back. It is of oblong shape with rounded ends. It is 7 inches long, 3 inches wide, and ⅝ inch thick. The bristles are in tufts, in 8 by 18 rows, and the tufts are cemented into holes in the block. The outer row is made of horsehair instead of hog bristles. The bristles are 1 inch long, measured from the face of the block. The handle and dauber are securely fastened to the block of the polisher by means of screws.

No. 2 is a polisher only, and has no handle. The block is made of white-pine wood with a veneering of walnut on the back. It is oblong in shape with rounded ends. It is 8¾ inches long, 2¾ inches wide, and ⅝ inch thick. The bristles are in tufts in 7 by 18 rows, and the tufts are cemented into the block. The outer row is of horsehair instead of hog bristles. The bristles are 1 inch long, measured from the face of the block.

No. 3 is a dauber only, and has a handle. The block is made of black-walnut wood. The block and handle are in one piece, 7 inches long and ½ inch thick. The block is 2 inches in diameter, and the handle is 5 inches long. The bristles are in tufts in concentric circular rows, and are 1½ inches long.

Blacking brushes for Army use are generally made of American bristles, but when they are not available of proper quality, German bristles are used.

Blacking brushes are liable to damage by moths. They are packed by the manufacturers in moth powder, known by different names, as tarine, campholine, etc.

They are put up in cartons containing six brushes each, and twelve cartons are packed in a case.

BRUSHES, HAIR, LARGE.

Hairbrushes are of numerous varieties. They are mostly imported from France and England, and while they are sometimes made with solid backs, they are usually not so made.

The large hairbrush purchased for the Army is a 13-row, solid-back brush of bleached bristles, arranged in tufts, $\frac{1}{2}$ inch long, cemented separately into the block. The blocks are made of different kinds of wood, among them boxwood and olive wood.

They are packed two in a box and seventy-two in a case.

BRUSHES, HAIR, SMALL.

The general remarks on "Brushes, hair, large," apply to "Brushes, hair, small."

The small hairbrush furnished the Army is a 9-row, solid-back brush, made of bleached American bristles, arranged in tufts, $\frac{5}{8}$ inch long, cemented separately into the block. The block is made of olive wood.

They are packed two in a box, seventy-two in a case.

BRUSHES, NAIL.

Bone-handle bristle nailbrushes only are kept by the Subsistence Department for sale to officers and enlisted men of the Army.

They are not manufactured in the United States, but are made in Paris and London, and are of endless variety. Those used by the Army are $6\frac{3}{4}$ inches long, and are made of bleached Russian bristles, $\frac{5}{8}$ inch long, measured from the face of the block, and are arranged in small tufts, in 10 by 24 rows. The distal end of the handle is fashioned into a nail cleaner.

The handle and block should be well finished, and the bristles even, stiff, and well fastened into the block.

They are packed in cartons of two sizes, containing six and twelve brushes, respectively.

BRUSHES, TOOTH.

Toothbrushes are made of bleached German or Russian bristles. The bristles are fastened in various ways, each manufacturer having his own method.

The quality of toothbrushes is determined by the quality of the bristles, etc.

Toothbrushes are, with respect to the stiffness of the bristles, designated as "hard" and "soft."

They are put up in cartons containing twelve brushes each.

BUTTER.

Butter is made in June and October. That made in October is thought to be the best. It is usual, when butter is purchased for the Army, to see that it is not inferior to the grade "extra" of the mercantile exchanges.

If butter is obtained in wooden packages, it is essential that they should be thoroughly seasoned and free from odor.

Creamery butter is, also, put up in hermetically sealed tin cans of several sizes, but the 3-pound size is preferable for Army use. This has proved a success for shipment to distant Army posts.

It is put up in cases containing twenty-four cans each.

Where butter is consumed near the point of supply, the usual tub of 58 or 60 pounds is a satisfactory package. When the demand is not large enough to justify the purchase of butter in tubs for use at posts near the point of supply, firkins containing about 36 pounds should be purchased.

In buying butter the trier should be run from one end of the package to the other. The "drawing" should be uniform in grain, texture, and color. The color should be a rich golden hue, and the odor and taste sweet.

Butter, during transportation and in store, should not be subjected to a temperature greater than 70° F. It should not be kept long in store, but, temperature being considered, the supply should be renewed frequently.

The adulterations are lard, buttermilk, and salt. Butter should not, as a rule, contain more than 1½ to 2 per cent of salt.

The knife used for cutting butter out of a package should be washed every day in boiling-hot water, as otherwise the butter adhering to it will become rancid and contaminate the butter in the package.

BUTTONS.

BUTTONS, COLLAR, GILT.—The Army is furnished with two kinds of gilt collar buttons. They are double gold plated, with pearl back; one with hinge and the other without hinge. The gilt should be evenly put on. The button should be well made, the hinge strong, and the plating good.

They come twelve buttons to the card, put up in cases as may be ordered.

BUTTONS, TROUSER, LARGE.—That furnished the Army is a metallic button, one of the cheapest varieties, but well made.

In purchasing buttons, care should be taken to see that they are well finished, so that they will not cut the thread. This is a danger to be guarded against with all metallic buttons.

They may be packed in small cartons of 1 gross each (four paper packages of thirty-six buttons each).

BUTTONS, TROUSER, SMALL.—The preceding remarks on "Buttons, trouser, large," are applicable to "Buttons, trouser, small"—the only difference being in size.

CANDLES.

Candles are made from tallow, by saponification, eliminating all of the glycerin and a portion of the red oil, according to the quality of the candle, leaving stearic acid in combination, out of which the candle is made.

The stearic-acid candle, the best for Army use, is made wholly from stearic acid, which is run into molds with a wick varying in size from forty-eight to fifty-one strands, according to size of candle.

Candles are usually white, and have a crystalline fracture and very smooth surface. They may be sometimes not quite white, but this does not affect their quality. The size of the wick is determined by the circumference of the candle.

If carelessly molded, there will be sputtering in the blaze, indicating the presence of water. The quality of candles is

indicated by the rate of burning and the brightness of the blaze. The "cup" should be dry while burning, showing that the wick is of proper size and that the stock is properly consumed.

The commercial sizes are eight to the pound and six to fourteen ounces. Full-weight sixes only, in 40-pound boxes, are furnished to the Army.

Lantern candles are manufactured in the same way as ordinary candles. They are made ten to the pound, and, for Army use, are packed in boxes containing 40 pounds each.

Candles will stand any kind of storage, need no particular care in transportation, and will keep equally well in all climates.

CAN OPENERS.

The can openers furnished the Army should be strong, well finished, and well tempered.

CHAMOIS SKINS.

Very few "chamois" skins are really made from the skin of the chamois. They are tanned goat and sheep skins—the tanning being done in Greece and Turkey.

The tanning should be well done, the skins smooth on both sides and free from thin places.

They are imported direct from England in kips of thirty skins.

Those furnished for the Army are from 2 to 2½ feet square.

CHEESE, EDAM.

Edam cheese is made in the northern part of Holland. The best is made in summer and is called "grass" cheese. The fresh cow's milk is filtered, and the rennet added to it. After the milk has curdled, the whey is carefully separated from the mass, the curd is thoroughly kneaded and then put into molds and slightly pressed, so as to remove the whey that may be left in it. This process has to be repeated until the curd is completely dry, when it is wrapped in a linen cloth, and there kept from eight to ten days, or until the cheese is somewhat firm. Then the cloth is removed and the cheese is put into a salt lye for some time. Further salting is done by

strewing dry salt on the cheese, until it has taken up salt enough to preserve it from decay. At this point the cheese is put into a vessel, washed with whey, and scraped until the white crust has been removed, and while still in that condition the cheese is brought into a cool room and laid upon boards, where it is frequently turned around; while there it obtains the fine yellow color peculiar to Edam cheese. The ripening process in the cool room lasts from two to three months. If the cheese is intended for exportation it is rubbed with linseed oil, so as to make the rind hard and bright. It is often dyed by the use of the sap of the *Croton tinctorium*, a plant cultivated in Southern France. Edam cheeses are of globular shape and weigh from 36 to 48 pounds per dozen.

CHOCOLATE.

The chocolate of commerce is made from the seeds of the cocoa tree (*Theobroma cacao*), which is indigenous to South America, Mexico, and the West Indies. Chocolate is made on an extensive scale in France, where its manufacture has perhaps attained the highest state of perfection, but an excellent quality is made by several well-known manufacturers in this country.

The process of manufacturing chocolate is as follows, viz: The cocoa seeds, after being sifted and picked, are gently roasted until the required color and aroma are developed. The relations of color and taste to the roasting of the seeds make the roasting, from beginning to end, one of the most delicate processes of the manufacture. After cooling, the seeds are lightly crushed and winnowed, to separate the husks from the kernels. The product is next reduced to a homogeneous paste by trituration, at the temperature of 130° F., in a mortar or a mill. The paste is then mixed with from one-half to an equal weight of sugar and a small quantity of extract of vanilla added for flavoring.

The paste is then run into molds and formed into cakes or tablets.

Chocolate is usually made in ½-pound cakes. Two ½-pound cakes are put up in a paper package, and twelve of these packages, weighing 12 pounds, are packed in a box.

Chocolate is largely adulterated and, therefore, should be purchased from a reliable manufacturer only.

Good, unadulterated chocolate is compact, brittle, and of a reddish-brown color. It should break under only a moderate strain, and the fracture should be clean and show a fine grain. When worked into a paste, it should be perfectly homogeneous. It should melt easily in the mouth, and have a pleasant, fresh flavor. It should dissolve readily in milk or water, leaving no residuum.

The quality of chocolate is determined by comparing its infusion with the infusion of a sample of known standard quality.

To make infusions of different kinds of chocolate, proceed as follows, viz:

Plain Chocolate.—Scrape fine 1 ounce of the chocolate, mix with 1 ounce of sugar, and add boiling water in sufficient quantity to dissolve both chocolate and sugar. Then add boiling milk until the preparation reaches the volume of 1 pint. The infusion is then ready for use as a beverage, although some persons subject it to a boiling of from five to ten minutes.

If a lighter infusion is desired, use only boiling water and no milk.

Vanilla Chocolate.—Use a porcelain or an earthenware or an enameled-ware pot; for each cup of infusion required to be made, pour into the pot one cup of cold milk and break (do not grate or scrape) into it one of the six tablets into which every ½-pound package of vanilla chocolate is divided; stir briskly over a bright fire until the chocolate is thoroughly dissolved; keep on stirring until the infusion boils up once, when it is ready for use as a beverage. The pot used for making chocolate should be used exclusively for that purpose. In stirring, it is desirable to use a wooden spoon, and not a nickel or silver plated spoon, as the flavor of the infusion is susceptible to injury by the use of a metallic spoon. It is quite important to know that it is necessary to use milk, or milk and water, and not water alone, in making chocolate, as, when it is made with water alone, it has a flat, insipid taste, and is deficient in nourishment.

Chocolate differs from cocoa, another preparation from cocoa seeds, in the form of a powder, in that the cocoa butter has been extracted from the latter.

Chocolate should be kept in a cool, dry place and should not be exposed to the sun. It is not advisable to keep chocolate on hand any great length of time, although it is known to have kept in good condition, when well taken care of, for eighteen months.

CIGARS.

For cigars, the finest and most delicate tobacco should be used. Cigars are made by hand, or by hand and machine—the finest by the first method.

The best tobacco for making cigars comes from Cuba; the Vuelta Abajo, so called from the locality where it is grown, being the best. The Patridas and Vuelta Arriba, from Cuba, are also largely used, and, in some seasons, the former is nearly, or quite, as good as the Vuelta Abajo.

Pennsylvania, Connecticut, and Ohio furnish "seed-leaf" tobacco, raised from Havana seed, from which the cheaper domestic cigars are chiefly made.

Sumatra furnishes excellent wrappers, which are used for most domestic cigars of the better grade.

The Philippine Islands produce the Manila cigars and cheroots, which are cigars with both ends cut square.

A "Clear-Havana" cigar has Havana filler, binder, and wrapper. A "Seed-and-Havana" cigar has Havana filler, Connecticut-seed binder and wrapper, or Havana filler and binder and Connecticut-seed wrapper. A "clear-seed" cigar has Connecticut-seed filler, binder, and wrapper.

Some cigars are made while the tobacco is sufficiently "green," *i. e.*, has in it sufficient natural moisture to admit of handling, but generally it is moistened before handling.

The core consists of fillers, laid longitudinally in sufficient quantity to form the bulk of the cigar; these are closely rolled, then enveloped with the inside wrapper or binder, which is as long as the cigar and wide enough to fairly inclose it; then the wrapper is put on spirally from the larger to the smaller end, where it is twisted to a fine point.

The fillers give the flavor to a cigar; the wrapper, and the skill with which it is put on, give it style. The best tobacco for wrappers is neutral, *i. e.*, has no pronounced taste.

After being "formed," either by hand or molds, cigars are sorted according to color and size, and packed in boxes containing twenty-five, fifty, or one hundred each, and designated, respectively, $\frac{1}{40}$, $\frac{1}{20}$, and $\frac{1}{10}$, meaning one-fortieth, one-twentieth, and one-tenth of a thousand cigars, respectively.

For shipment, the boxes are packed in cases.

The strength of cigars, which varies with each character of tobacco, is indicated by the color, the lightest being generally the mildest.

The colors of cigars, from light to dark, are as follows, viz: Claro, Colorado-Claro, Colorado, Colorado Maduro, Maduro, and Oscuro; and the sizes are determined by the length, which ranges from 4 to 5 inches.

As the kind of cigar preferred is largely a matter of taste, depending upon familiarity, no rule for selection can be given. Outside appearance is of little value in determining the quality; a good cigar, when split longitudinally, should be found free from dust, small pieces, large stems, and musty tobacco.

The style or size and shape is indicated by terms common to all makers, which are usually found upon the front of the box. In procuring cigars it is necessary to give the name of the manufacturer or factory and the quality of the cigar, as simply calling for a "Concha," etc., would mean only a cigar of that shape and style and give no definite information as to what was needed.

The following are a few of the most prominent names used to designate the sizes and shapes:

CONCHA.—The word means "a shell." The cigars were named such after a former captain general of Cuba named Concha. They are usually $4\frac{1}{4}$ inches long.

CONCHA FINA.—A fine Concha.

CONCHA ESPECIAL.—Finer finish than a Concha, and a little larger size, principally in length.

LONDRES.—One of the first styles made; the word means "London," the cigar so named because of its popularity in England.

REGALIA.—Means "present" or "gift," designating a cigar of a finer grade of tobacco than is used for Londres and Conchas.

REGALIA DEL REY, or King Regalia, generally packed in bundles of 50 each, of medium size, 4¼ inches long.

REGALIA REINA, or Queen Regalia, a smaller size.

CHICA.—A smaller-sized cigar than Regalia, packed in two bundles.

REGALIA COMME IL FAUT.—Indicates a very handsome cigar, finished in a better manner than a Concha, and made from very fine tobacco.

REGALIA BRITANNICA.—A thick, heavy cigar, 5 inches long, weighing 18 pounds or over to the thousand.

DAMAS.—A very small cigar, about 2 inches long.

DAMAS IMPERIALES.—Very fine tobacco, well made; also small.

PANETELAS.—"Sponge Cake;" a long, slim cigar, that has been heavily pressed.

NON PLUS ULTRA.—Large, handsomely made from finest tobacco.

CORTADA.—Cigar cut off at both ends.

HABANO.—Habano-shaped or pointed cigar.

NAPOLEONS and IMPERIALES are very large cigars, fancy sizes, but little used.

EXCEPCIONALES.—A very large cigar, similar to Regalia Britannica.

OPERA.—Small after-dinner or theater cigar, about 3¼ inches long.

PRINCESAS.—Small cigar, similar to and thinner than an Opera.

Cigars should be stored in a cool, moderately dry place, and should not be exposed to artificial heat. Consumers can moisten, or "ripen," them to suit.

CINNAMON.

The cinnamon of commerce is prepared from the inner bark of the *Laurus cinnamomum*, a small evergreen tree which is a native of Ceylon, but is cultivated in South America and the West India Islands.

Ceylon is the source of supply of the cinnamon of commerce. The amount which comes to this country is so small, however, as to be almost insignificant in comparison with the amount of wild cinnamon (*Laurus cassia*) or cassia, which comes from the coasts of Siam and Cochin-China.

The cinnamon tree, when cultivated, is kept cut down close to the ground, and the fresh, new shoots only are allowed to grow until they attain a height of from 5 to 6 feet, and are then about ½ inch in diameter; these dimensions are obtained in about two years, and the shoots are usually free from branches, except near the top. They are then cut close to the ground and the grayish outside bark carefully cut off.

The inner bark, which is of a yellowish-red color, is then ripped up longitudinally with a knife, and gradually loosened until it can be taken off. When taken off, it is spread in the sun to dry, when it curls up into the quill-like form of the commercial article.

There are usually two crops of cinnamon gathered in Ceylon, one in May and the other in November—the first being the larger of the two, and more easily gathered, as the sap is more abundant at that time and allows the bark to be detached with greater facility.

Wild cinnamon or cassia is prepared in the same manner as the real cinnamon, but as there is much of the former gathered there is consequently a lack of uniformity in the thickness of the bark and in the perfection of its preparation, two distinguishing features of Ceylon or real cinnamon, which account for the higher price of the latter.

The bark of cinnamon is scarcely thicker than drawing paper, and breaks with an uneven and fibrous margin. Each stick consists of eight or more pieces or quills of bark inserted one within the other. Cassia bark is very much thicker than cinnamon bark, and breaks short, without splintering.

When in the powdered form, it is extremely difficult to distinguish cinnamon from cassia; and, when they are mixed together, it is impossible to do so without resort to a chemical test.

When powdered bark is treated with a tincture of iodine, if it is cinnamon, there is little effect perceptible; if it is cassia, a deep blue tint is produced; and if it is a mixture of the two, the intensity of the coloration will indicate the proportion of cassia.

CLOVES.

Cloves are the dried flower buds of the *Caryophyllus aromaticus*, an evergreen tree which grows in the Moluccas, Mauritius, Sumatra, and nearly all the Spice Islands of the Indian Ocean, and in the West Indies. The larger part of the commercial supply, however, comes from Amboyana, on the island of the same name.

The cloves of commerce are not, as many suppose, the fruit of the clove tree, but are, as above stated, the dried flower buds. The ripe fruit resembles in shape a small olive; it is of a dark-red color, and is slightly aromatic in flavor. It sometimes appears in commerce, in a dried state, under the name of "Mother-of-cloves." Mother-of-cloves is not so pungent as the flower buds. These flower buds, when first gathered, are of a reddish color, but in the drying of them, which is partly done by wood fires and partly by the sun, they turn to the familiar deep-brown color of the cloves of commerce.

The flower buds are sometimes deprived of their oil before being put on the market, and the oil sold as the oil of cloves. Cloves made by subjecting the flower buds to this treatment are not much impaired in taste, but are very deficient in odor. Such cloves are not suitable for Army use.

Ground cloves are largely adulterated with clove stems, allspice, flour, etc.

For Army use, ground cloves only, put up in 4-ounce tins, are used.

CODFISH.

The cod is pre-eminently the fish of commerce. The cods inhabit the waters of the North Pacific, North Atlantic, and

Arctic Oceans, and are seldom found in large numbers south of 36° north latitude.

They never visit fresh water and live mostly in deep water, visiting the shallow waters of the coasts and banks only for the purpose of spawning and raising the young fish.

For generations the cod fisheries off Newfoundland and Labrador have furnished the civilized world with codfish, and France, Great Britain, and the United States with a training school for sailors.

These fishing grounds are still the most productive, but those of the Sea of Okhotsk, Bering Sea, and their adjacent waters, are of importance.

San Francisco and Seattle are the only ports on our Pacific Coast from which the codfishing industry is prosecuted.

In the Eastern States, hake, haddock, cusk, etc., are sometimes sold as codfish; this swindle, however, has not yet been practiced in the Pacific States, and probably never will be, as the substitute fishes are not found in the adjacent waters.

On the Pacific Coast, the codfish season lasts during the year; but on the Atlantic Coast the best catches are made on the George's Banks in January and February; on the Western Banks in May and June; and on the Grand Banks from May to November.

Cods are caught with hook and line from the sides of the vessels, but principally from dories sent out from the vessels. The dories are small boats, about 15 feet long, and are managed by a single sailor-fisherman. The sailor-fisherman has two lines, and as soon as he has a load of fish they are taken to the vessel or the shore station and immediately dressed and salted. The salt is carefully sprinkled upon each fish.

There are many varieties of codfish, but those caught on the Grand Banks and George's Banks are the best, and they are known in the market as the "Grand-Banks" codfish and "George's-Banks" codfish, respectively, the former being considered the better of the two. They are graded, according to size, into large and medium. The large size should measure 22 inches, and the medium not less than 18 inches, from the tip of the tail to the nape of the neck.

The codfish has some marked characteristics from which it can be distinguished from its congeners. The longitudinal stripe running along its side from gills to tail is a faint, white line; its scales are quite small; its tail is square, and its skin is spotted. When skinned, preparatory to packing in fancy forms, it is very difficult, except for an expert, to distinguish its meat from the meats of other similar fishes. With some experience, one may be able to distinguish it by its color. The meat of the Grand-Banks codfish is of a greenish-white color, and that of the George's Banks, white, while that of the haddock is a bright white, and that of the cusk, white with a pinkish cast.

They are put up for market in several styles, mainly unskinned and whole; skinned and cut up; and shredded in bricks.

If codfish are "new," that is, have not been kept in "kench" and pickle more than three months, and are well dried and kept stored in a cool, dry place, they will keep well for from three to six months; if spread out, they will easily keep in good condition for a year or more. A moist heat will cause codfish to "sweat," after which it will spoil in a few weeks. Dry heat or exposure to the sun will "burn" the fish, but while this does not spoil its eating qualities, it spoils its keeping qualities and causes the fiber to become tender and crumble, as if it were overcooked.

The growing of a red fungus on codfish is an indication that it is spoiling, and when thus affected it should not be purchased. The growing of this red fungus can be prevented by the use of a mixture of boracic acid and salt, called "Preservaline," a German discovery, which prevents decay and does not especially affect the taste or flavor of the fish. It should be used on all codfish shipped in warm weather, or, at all seasons, on all codfish shipped to places located in warm climates.

Care should be taken to see that codfish is new, firm, and white, and that it readily softens when placed in cold water and the latter brought nearly to the boiling point and kept at that temperature for an hour.

Codfish being of a perishable nature, no more of it should be kept on hand than necessity requires. It should be stored in a cool basement or cellar, and, if it is required to be transported in warm weather, it should be in refrigerator cars, or, if in a vessel, in the hold. It should never be exposed to the direct rays of the sun.

COFFEE, ISSUE.

The use of coffee was introduced into Persia from Ethiopia as early as A. D. 785, and into Arabia, from Persia, about the fifteenth century of our era. In A. D. 1554, coffee was publicly sold in Constantinople, and reached Venice in A. D. 1615. The first coffeehouse was opened in London, A. D. 1652, by the servant of a Turkish merchant, and, at the close of that century, the annual consumption in that city had reached the amount of 100 tons. The culture of coffee was first introduced into Java by the Dutch, between A. D. 1680 and 1690, and was subsequently extended throughout the East India Islands. In A. D. 1720, its cultivation was introduced into the Island of Martinique, where it succeeded so well that in a few years all the West India Islands were supplied therefrom.

The coffee of commerce is the seed of the *Coffea arabica*, an evergreen shrub or small tree, with opposite, shining leaves, and white, fragrant flowers, which grow in clusters in the axils of the leaves. It grows to the height of about 20 feet, but in cultivation is kept down, by pruning, to about 5 feet, to increase its productiveness, and for convenience in picking the berries. The plants are raised from the seed, in nurseries, and, when one year old, they are transplanted and set out in rows. The growing trees begin to bear fruit when they are three years old, but do not reach maturity until they are five years old. The tree continues in bearing for twenty years.

The coffee tree blooms for eight months in the year, so that the ripe coffee berries may be gathered at almost any season. There are, however, two, and sometimes three, regular har-

vests during the course of the year. Where the climate is very dry, abundant irrigation is necessary, but the water is shut off when the berries begin to ripen, as the quality of the coffee derived therefrom is thereby improved.

The coffee berry very much resembles the red cherry, and, in ripening, first turns red and finally purple. The fleshy portion surrounding the seeds is sweet and palatable. Each berry contains two seeds or beans of semi-ellipsoidal shape. The two beans lie in the center of the pulp of the berry, with their flat sides toward each other, and are closely enveloped in a tough membrane. Sometimes one of the beans is abortive, and then the remaining one grows round. As the berries dry, the pulp forms a sort of shell or pod, which is removed by a process of curing, in order to prepare the beans for market.

In the West Indies, the berries are picked by hand at intervals during the seasons of harvest; but in Arabia, where there are no rains which would beat them from the trees, they are allowed to remain until they are wholly ready to fall off, and are then shaken down on sheets of canvas spread on the ground. The perfect ripeness of Arabian coffee is probably one of the principal reasons for its superiority of quality.

In the West Indies and South America, the curing is usually effected by exposing a layer of berries, several inches in thickness, to the heat of the sun until fermentation takes place. When the moisture developed in the process of fermentation has disappeared, the dried berries are crushed by running them through a large pair of wooden rollers or by pounding them in wooden mortars, and the dried pulp is then washed away and the beans left in their tough, membranous envelope. The beans, after being dried, are run through a pair of heavy rollers, which break up the envelope. The resulting chaff is removed by winnowing, and the beans, in the form of the coffee of commerce, are left behind.

The following is a description of the gathering and preparation for market of the coffee crop in Ceylon:

In the height of the crop the fruit is taken to the pulping mill at midday, and again in the evening. The task given to

a coolie is to bring a bushel of berries at each collection. From good-bearing coffee trees some quick hands will gather as much as 4 bushels a day, for which, of course, they get extra pay. The berries are very much like cherries, and it would puzzle most persons to distinguish a heap of coffee berries from a heap of cherries. Instead of a single seed or "stone," as has the cherry, the coffee berry has two symmetrical seeds or "beans," enveloped in a thick, leathery skin, which is called "parchment." After the thick pulp has been removed, the seeds are left in the cistern until such time as fermentation sets in; the mucilage is then worked off, and the beans are then in condition to be carried to the drying ground. The drying of the beans is a most important process, as a shower of rain will discolor them, and much depreciate their value. A constant watch is, therefore, kept for rain clouds, and dreadful is the noise and hurry when they appear and threaten in a few minutes to break over the precious parchment on the barbecues. When thoroughly dried, the parchment is put in bushel bags and sent to Colombo. It then undergoes another drying preparatory to being relieved of its husks. The husks are removed by putting the parchment in annular troughs wherein work heavy rollers, which break the membranous envelope without injuring the beans. The beans are then "sized," *i. e.*, they are separated into three lots—large, medium, and small. The sizing is done to promote equable roasting, which is very important, as a small bean would be burnt into charcoal by the time a large one would be sufficiently roasted. Much care is given to sizing by Colombo merchants who undertake this part of the preparation of coffee for market, and well understand its importance.

"The quality of coffee depends very much on the district in which it is grown and its elevation above the level of the sea—the greater the elevation the finer the quality. Maturalto has long been famous for the quality of its coffees, and its plantations are all upward of 4,000 feet above sea level."

In some places, an infusion of the raw coffee beans is used as a beverage, but the general custom is to use an infusion of

the roasted beans, because roasting develops their aromatic properties, which are communicated to the infusion.

The object of roasting coffee, as above indicated, is not only to render it friable, to facilitate the grinding of it, but to create or develop its aromatic, volatile oil; and great care is required to limit the operation so that the good effects of creating or developing the aromatic, volatile oil may not be destroyed by burning the substance of the beans.

The roasting is done with a machine called a coffee roaster, which consists of a revolving sheet-iron cylinder set over a furnace. The roasting is effected by putting the proper quantity of coffee into the sheet-iron cylinder, which, by means of proper machinery, is slowly turned around on its axis over the fire in the furnace, so that all of the coffee beans shall be equally exposed to the heat.

The natural color of coffee beans is a dull, pale green; but they acquire two other colors, in succession, in the process of roasting, viz, yellowish brown and chestnut brown. The degree of roasting indicated by the yellowish-brown color, which causes a loss in weight of 12½ per cent, is insufficient, and must be advanced to the degree indicated by the chestnut-brown color, which increases the loss in weight to 20 per cent. This latter amount of loss in weight, which chiefly represents expelled water, is the basis of the difference between the green-coffee component of the Army ration and its roasted-coffee equivalent—the former being 10 pounds to the hundred rations, and the latter 8 pounds.

Roasted coffee deteriorates by absorbing moisture when exposed to the air, and should, therefore, be put up in air-tight packages, preferably hermetically sealed tin cans or canisters. It is, also, very susceptible to damage by absorbing odors from other articles, and raw coffee is liable to damage in the same way.

Raw coffee is frequently rendered musty by moisture absorbed during the voyage of importation. When coffee becomes musty its delicacy of flavor is much impaired, and no process of so-called renovation can in any degree restore it.

The chemical composition of raw coffee beans is as follows, viz:

	Per cent.
Caffeine	0.8
Caseine, or legumine	13.0
Dextrine and sugar	15.5
Fat and volatile oil	13.0
Mineral matter	6.7
Caffeo-tannic acid Caffeic acids	5.0
Cellulose	34.0
Water	12.0
Total	100.0

The chemical composition of roasted coffee beans is as follows, viz:

	Per cent.
Water	5.0
Albuminoids	15.0
Caffeine	0.6
Tannin	4.0
Minor extractives	32.4
Cellulose	38.4
Mineral matter	4.6
Total	100.0

There are several kinds of coffee imported into the United States from the South American and Central American States and Mexico. From Brazil, the principal kinds are "Rio" and "Santos;" from the Central American States, "Costa Rica," "Guatemala," "Salvador," etc.; and from Mexico, "Cordova."

The coffees of Brazil vary greatly in color and size of bean. Most of the "Rio" coffee (so called from the city of Rio de Janeiro, the port from which it is exported) has a small bean, varying in color from a light to a dark green. Some of it is of a yellow hue, and this is called "Golden Rio." Large quantities of the Brazilian coffees are artificially colored to meet the requirements of certain sections where a prejudice exists in favor of coffee of particular colors. Various chemicals are used in the coloring process, some of which are poisonous, while others are comparatively harmless. The flavor of most of the Rio coffee imported into the United States is quite marked and entirely different from that of any other

kind, and its smell and appearance are also quite distinct and characteristic. The Santos variety, the next in importance, is grown in the southern portion of Brazil, contiguous to the Rio district, but differs from the Rio in flavor and appearance of the bean. It has a milder flavor than the Rio, and is by many preferred to it.

Of the Central American coffees the Costa Rica and Guatemala are the most important. The Costa Rica bean differs in shape from the Rio, while in color it varies from a dark to a light grayish-green. It has a fine, rich flavor. The Guatemala bean varies in color from a dark to a bluish green, is unusually uniform in size, and has a fine flavor.

The Cordova coffee has larger and longer beans than the Central and South American coffees. It is of uniform size, well cleaned, and usually of a green color. It is often polished and sold as Java coffee.

All coffees improve with age, and should be at least one year old before being used.

TESTING THE QUALITY OF COFFEE.—The appearance or "style" of raw coffee is not always an index of its quality, and, therefore, the only reliable method of determining its quality is to roast and grind it, and make an infusion from the resulting powder.

To make infusion tests: Roast to a chestnut-brown color and grind to a fine powder a small but sufficient quantity of each of the samples of raw coffee to be tested, and, also, a like quantity of the sample of the standard raw coffee; place carefully weighed equal quantities of the ground samples, respectively, in as many clean coffeepots and pour on them equal quantities of boiling-hot water, and draw. Test the infusions for odor as soon as practicable, and for taste as soon as they are cool enough to be tasted without discomfort; and then, after allowing the infusions to stand a little while, test them again. If any bad qualities escape detection in the first test, they will show themselves in the last.

TEST FOR ADULTERATIONS IN ROASTED AND GROUND COFFEE.—Pure roasted and ground coffee will give but little color to cold water until after the mixture has stood for about ten

minutes, while such adulterations as roasted and ground chicory, and other roasted and ground roots, and powdered burnt caramel, will color the water immediately.

Coffee for issue to the Army is purchased in the commercial packages, which are double sacks containing about 130 pounds, net.

Coffee requires dry, well-ventilated storage; and, as it readily absorbs foreign odors, it should not be stored near such articles as pepper, tobacco, etc.

COFFEE, JAVA.

Java coffee is so named from the Island of Java, where it first became an article of commerce.

It has a good-sized bean with quite a large suture; and, as found on our market, is distinguished into pale yellow, which is the newer and cheaper kind, and yellowish brown, which is the old and dearer kind. At the time of the shipment from the port of exportation it is of a light-green color, but it changes during the voyage of importation to a pale yellow. Age improves its quality immensely, and as its color deepens with advancing age, the darkest yellowish brown is the best.

The crop is gathered in the months of January, February, and March. It is put up in small grass mats containing from 65 to 68 pounds, net. Each mat is marked with a letter or letters indicating the district where grown. For Army use, two of these mats are put up in a gunny sack.

The Java coffee of commerce comes from the islands of Java, Sumatra, and Celebes, which possess similar conditions as to climate and soil; and it should be noted that conditions as to climate and soil powerfully influence the quality of coffee. Almost the entire amount of Java coffee consumed in the United States comes from Padang, on the Island of Sumatra.

The Sumatra brands of Java coffee are as follows, in the order of merit in which they have ranked for years, viz: Mandheling, Ayer Bengies, Ankola, Painan, and Padang.

There are a number of coffees in the markets purporting to be Java which are not Java; they come from Brazil, the Island of Ceylon, and Singapore. Ceylon Java is the only one

of them that nearly approaches Java in quality. At the Centennial Exposition, in Philadelphia, there was an exhibition of Brazilian-grown coffee, under the name of "Imitation Java Coffee," which was very inferior to, and materially different from, the exhibit of Java coffee from the Dutch East Indies; and this Brazilian Java is the fictitious Java chiefly sold in the United States.

The best method of determining the quality of Java coffee is by the infusion test described in the article on "Coffee, issue."

Java coffee requires the same kind of storage and the same care while in storages as "Coffee, issue."

COFFEE, MOCHA.

Mocha coffee derives its name from the town of Mocha, in Arabia, but it is chiefly grown on the hills of Yeomen, lying near the districts of Mocha and Aden.

The excessively hot and dry climate and the very sandy nature of the soil of the Yeomen-hills region render irrigation and shade indispensably necessary to the cultivation of the coffee; and these peculiarities of climate and soil are supposed to account for the smallness of size and the acridness of flavor of its bean.

The bean is small and, when new, is of a yellowish-green color, which, with age, changes to greenish olive; and, instead of having the usual flat side, is often round, because one of the two sides of the bean is abortive.

Mocha coffee is put up in bales containing either eight smaller packages of 50 pounds each, called "eighth bales," or four smaller packages of 80 pounds each, called "quarter bales." These packages are of peculiar shape and construction, and are made of a very coarse bagging cloth and sewed with a vegetable substance that becomes hard and very tough with age. The package most suitable for Army use is a strong gunny sack -four eighth bales.

Much of the coffee sold under the name of Mocha is produced in the East India Islands and Brazil, and sent to a Mocha coffee port, and then reshipped as the genuine article. A great deal of the so-called Mocha coffee is often nothing

more than the carefully selected small, round beans from the tops of the branches of the Brazilian plant. It is supposed that only about one-half of the imports received into the United States under the name of Mocha coffee are of Arabian growth.

At Aden and Alexandria the Mocha coffee is carefully picked over and assorted into lots containing larger and smaller beans, respectively, in conformity with a singular fashion of the trade which creates a demand in Europe for the larger beans and in the United States for the smaller. In point of fact, the larger beans are best, because they are more fully developed and consequently have a better flavor.

The quantity of Mocha coffee annually exported from Aden amounts to about 8,000,000 pounds. The bulk of this goes to London and Marseilles, but two or three of the principal importers in this country have agents at Aden and Alexandria who purchase the genuine Mocha coffee and ship it to New York and Boston.

The new crop arrives at New York and Boston about May.

Raw Mocha coffee has a very pleasant odor, not unlike that of pineapple. When freshly roasted it emits a rich aroma. The infusion of the roasted and ground Mocha coffee has a heavier body and a less delicate flavor than the infusion of roasted and ground Java coffee.

The best method of determining the quality of Mocha coffee is by the infusion test, which is described in the article on "Coffee, issue."

Mocha coffee requires the same kind of storage, and the same care while in store, as "Coffee, issue."

COMBS.

The combs furnished for sale to officers and enlisted men of the Army are as follows, viz:

Horn, coarse, medium size; horn, coarse, small size; rubber, dressing, and rubber, pocket.

The coarse horn combs of medium size are made of common horn. They are 6½ inches long and 1⅝ inches wide. The teeth are 1¼ inches long, one half fine and the other half

coarse. They are put up in cartons containing twelve combs each.

The coarse horn combs of small size are also made of common horn. They are 5 inches long and 1⅜ inches wide. The teeth are 1 inch long, one half fine and the other half coarse. They are put up in cartons containing twelve combs each.

Fine horn combs are made of common horn. They are 3 inches long and 1⅞ inches wide. The combs have fine teeth only, ½ inch long on both sides. They are put up in cartons containing twelve combs each.

Rubber dressing combs are 7⅜ inches long and 1 inch wide. The teeth are ½ inch long, one half fine and the other half coarse. They are put up in cartons containing twelve combs each.

Pocket rubber combs are 5 inches long and $\frac{15}{16}$ inch wide. The teeth are ½ inch long, one half fine and the other half coarse. Each comb has a patent-leather cover bound with tin. They are put up in cartons containing twelve combs each.

All combs for Army use should be well finished and have strong teeth.

CORN, GREEN, CANNED.

The only kind of corn that is suitable for canning is the variety known as sweet corn, the best quality of which is grown in the Northern States—that grown in the State of Maine being of the best quality of all.

The quality of canned green corn depends upon the quality and condition of the stock used and the skill and care used in canning it. It is very essential that green corn to be used for canning should be picked from the stalk just when it reaches the proper stage of ripeness.

Canners buy their green corn by the pound, cut from the cob, under engagements made in advance of the planting season, from farmers in the vicinity of the canneries.

For canning, green corn is usually picked from the stalk in the afternoon and left on the ground (not piled, as it would heat) until the next morning, when it is hauled to the cannery. It is, also, sometimes picked from the stalk early in

the morning before the dew is off it; and, when so picked, it is immediately hauled to the cannery.

Upon delivery at the cannery, each lot of green corn is tagged with the seller's name, and is kept separate until it is cut from the cob and the cut corn weighed.

The process of canning is as follows, viz:

The butts of the ears are cut off and they are then husked and thrown into baskets, in which they are sent to the cutters, who cut the corn from the cobs with a circular knife, gauged so as not to cut away the entire grains, but to leave the inner ends (about one-fourth of each grain) on the cob. The cobs are then scraped with the back of the knife, which takes out the "chits" of the adhering corn. The cut corn, including the chits, is then weighed, and the weight thus ascertained is the purchase weight of the green corn to be paid for. The cut corn is then silked with a silker, or a sifter, or by hand, and put into large, rectangular, galvanized-iron pans and kept in them until it is required for canning. In hot weather, a sufficient quantity of ice is put into each pan with the corn to keep the temperature of the corn low enough to prevent it from spoiling.

When the cut corn is required for canning, it is first well stirred and then taken out of the galvanized-iron pans and put into a cooker and heated until the entire mass has acquired a temperature of 240° F. The proper quantity of hot green corn and the proper quantity of saturated solution of sugar in water, or salt in water, are put into each can. When the cans are thus filled, they are soldered up and put into a retort, where they are processed for forty minutes or more, at 240° F. The hot cans are immediately put into a bath pan of the same capacity (about eighty-five cans) as the retort, and cooled with cold water, to preserve the white color of the corn—the corn acquiring a very dark color and becoming unsightly if allowed to cool naturally.

After being cooled, the processed cans are inspected, and the defective ones set aside. The latter are repaired with solder and then put back into the retort and reprocessed. They are then called "Do-overs," and put up and sold under bastard brands.

Canners use cannery brands on all goods of standard quality, and bastard brands on all goods of inferior quality.

Cannery brands are brands with which the name of the owner of the cannery is incorporated, and bastard brands are brands with which the names of the owners of the canneries are not incorporated.

Canned green corn, put up under other than cannery brands, should not be purchased for the use of the Army.

Canned green corn keeps best in dry storage of equable, moderate temperature.

CORN MEAL.

Corn meal is made from either white or yellow Indian corn; the white being raised in the Western and Southern States, and the yellow in the Northern States.

White flint corn makes the best corn meal, but good corn of any of the harder-seed varieties makes good corn meal.

The roller process of making corn meal is as follows, viz:

The corn, after being passed through a cleaner, is carried to, and crushed between, a pair of corrugated rollers, one of which revolves more rapidly than the other. The crushed product is then carried to a bolt and bolted—the finer part of the crushed product, which passes through the meshes of the bolting cloth, being corn meal. The part of the crushed product which tails over the end of the bolt is passed through a second pair of rollers with finer corrugations. The product of the second crushing is carried to a bolt and bolted, and the tailings carried to a third pair of rollers with still finer corrugations. The product of the third crushing is carried to a bolt and bolted, and the tailings carried to, and passed through, a fourth pair of rollers with still finer corrugations. The product of the fourth crushing is carried to a bolt and bolted, and the process is finished, the tailings of the fourth bolting being bran.

Granulated corn meal is made from the meal of the fourth bolting, by passing it through a purifier, which takes out the flour and fine particles, leaving only granulated meal. If granulated meal is not to be made, the meal of the fourth bolting is mixed with that of the former boltings.

By the old millstone process of grinding, corn meal is made at one grinding. That process generates more heat than the roller process, and injures the keeping qualities of the meal; and for this and other reasons the roller process is preferable to the millstone process.

Granulated corn meal is gritty and sharp to the feel, and is more uniform in texture, and contains a greater proportion of gluten than common corn meal.

Common or straight corn meal is the whole product of the corn grain, less the husk or bran. It contains a greater proportion of starch and is softer to the touch than granulated corn meal. The granulated corn meal costs more than the common corn meal, but it keeps better.

Corn meal, on account of deficiency in gluten, is not adapted to making raised bread without an admixture of wheat or rye flour. Corn meal can readily be made into cakes and baked, or boiled and fried; and containing, as it does, about the same percentage of nitrogenous matter as wheat, and upward of fourteen times the amount of fatty matter, it stands in a high position as regards alimentary value for soldiers in the field.

Corn meal, if kept long on hand, or if not properly stored and cared for, is liable to sour. It is also liable to injury by worms.

Corn meal purchased for the Army should be new, and, unless it is required for immediate use at or near the place of purchase, it should be kiln-dried.

Corn meal for ordinary Army use should be put up in barrels containing 200 pounds, net; or, if used at posts or places reached wholly or partly by wagon or pack-animal transportation, in double sacks containing 100 pounds, net.

Corn meal should be stored on skids, in a dry, well-ventilated storehouse.

CRABS, CANNED.

The season for canning crabs, or, accurately speaking, the meat of crabs, is from April to November. It is the general belief among packers of canned goods that crabs are canned by a process similar to that used in canning other articles of food. It is impossible, however, to learn the exact process,

as, apparently, there are some secrets connected with it that are most carefully guarded. The only successful packer, replying to a request for information, stated "It would give us great pleasure to comply with your request. * * * Our process is an original one that was only perfected after years of experiment and a very large outlay; many other brands have come upon the market only to disappear in a short time, which makes us believe that our secret is worth guarding."

Canned crabs should be stored in a cool, dry place, and be protected from the rays of the sun.

CRACKERS.

Crackers are the finer grades of what in England, France, and other countries except the United States, and often even there, are called hard biscuits; and are a kind of unfermented bread, formed into flat cakes and baked hard.

They are classified under commercial names as water crackers, soda crackers, oyster crackers, ginger crackers or ginger snaps, etc. They are also classified in a more general way as plain goods, sponge goods, and sweet goods.

Water crackers are an example of plain goods; soda crackers and oyster crackers are examples of sponge goods; and ginger crackers or ginger snaps, an example of sweet goods.

The ingredients of which crackers are made, which should be of superior quality, are generally mixed by machinery. When butter and lard are used, they are thoroughly mixed with the flour in the dry state; then the milk or water, in which the sugar or salt, when used, is first dissolved, is added, and the whole made into dough by a kneading or mixing machine. The dough is run through a heavy "break," the operation somewhat resembling that of a roller clothes wringer. It is then transferred to the cracker machine, where it is rolled into long sheets, dusted with flour, passed under the cutters, and cut into crackers. Some cracker machines deliver the crackers into the ovens, on pans, to be baked. The doughs for fancy crackers, except that for cream crackers, should stand overnight, and the doughs for all other crackers, except those containing an excess of soda, a few hours, before being passed through the break.

The temperature of the oven for baking crackers, cakes, etc., should be only high enough to give a nice brown color, without burning them. Crackers or cakes containing sugar should not, in baking, be raised to as high a temperature as those without it, because the sugar might thereby be caramelized, and the quality of the crackers impaired and their beauty destroyed.

The following varieties of crackers are furnished by the Subsistence Department for sale to officers and enlisted men of the Army, viz: Water, soda, oyster, and ginger.

WATER CRACKERS.—Water crackers should be made of a mixture or blend of equal proportions of straight white winter-wheat flour and patent white winter-wheat flour. The ingredients of water crackers are in the following proportions, viz: Flour, 196 pounds; salt, 1 pound; and water, 7 to 8 gallons. After the dough has been made and cut into crackers, the latter are "chafed" by hand, *i. e.*, the edges are turned up underneath into the crackers and they are thereby rendered air-proof, and given power to expand by the contained air when exposed to the heat of the oven in baking.

When chafed, the crackers are put into the oven to be baked. The temperature of the oven should not be higher than from 300° to 350° F. After being baked, they are put into the drying room and completely dried.

Water crackers chafed by hand, as above described, are called handmade water crackers.

The yield of water crackers is about 185 pounds to the barrel of flour.

SODA CRACKERS.—Soda crackers should be made of strong patent white winter-wheat flour. The ingredients should be in the following proportions, viz: Flour, 196 pounds; lard, 24 pounds; yeast, 1½ gallons; soda, 1¼ pounds; salt, 2 pounds; and water, 3 gallons.

A sponge is first made of about one-third of the flour, and left for about eight hours, to rise. When sufficiently risen, the sponge is broken, and the dough made by working into the sponge the remainder of the flour and the lard and the soda previously mixed therewith. The dough, also, is then left for about eight hours, or a sufficient time, depending on

the weather, to rise. When sufficiently risen, the dough is run through the break, and then through the cracker machine, and cut into crackers. The crackers are then put into an oven and baked.

For baking soda crackers, the oven should be considerably hotter than for baking water crackers.

OYSTER CRACKERS.—Oyster crackers are made of the same ingredients and in the same manner as soda crackers—the only difference being in the shape and size of the crackers. Soda crackers are square in shape and oyster crackers are round, and the former are larger than the latter.

GINGER CRACKERS.—Ginger crackers, or as they are commonly called, ginger snaps, should be made of patent white winter-wheat flour.

The ingredients of ginger crackers are in the following proportions, viz: Flour, 196 pounds; brown sugar, 80 pounds; lard, 38 pounds; ginger, 4 pounds; cinnamon, ½ pound; soda, 3 pounds; suet, 1½ pounds; molasses, 13 gallons; and water, ½ gallon.

It is best to let the dough stand for several hours, but it is not absolutely necessary.

For Army use, all authorized kinds of crackers are put up in 1-pound cartons, and packed in cases of such convenient sizes as may be required, reference being had to the quantities that may be needed to fill the different requisitions.

Crackers require dry, well-ventilated storage.

ELECTRO-SILICON.

Electro-silicon is a polishing powder used for cleaning gold, silver, gold-plated, silver-plated, tin, steel, glass, and other similar articles with polished, engraved, or chased surfaces.

It is generally used dry, with a piece of chamois skin or cotton flannel. A slight rubbing will generally develop the luster of the article. When, however, the dry Electro-silicon does not at once remove all tarnish or dullness, moisten it with water or alcohol, and then finish with the dry powder.

The powder is applied dry to chased or engraved surfaces with a soft jeweler's brush.

It is warranted not to scratch the most delicate surface.
It is a proprietary article, and its name is a trade-mark.
It is put up in 3-ounce flat, cylindrical wooden boxes.
It should be stored in a cool, dry place.

FLAVORING EXTRACT, LEMON.

Lemon flavoring extract is an alcoholic solution of oil of lemon.

The pure oil of lemon is made by hand, by simply squeezing fresh lemon peels against a sponge, which absorbs the oil contained in the peels. This oil is the fine hand-pressed oil of lemon of commerce, and is furnished chiefly by Southern France and Italy.

An inferior article of oil of lemon is made by distilling the outer rind of the lemon with water, and this cheaper and inferior distilled oil is used for mixing in greater or less proportions with the expressed oil, to make cheaper grades of oil of lemon.

Still cheaper grades of oil of lemon are made by adulterating the aforesaid mixtures with oil of turpentine. The oil of turpentine, however, soon becomes rancid and develops the turpentine odor, which declares the presence of the noxious adulterant.

Oil of lemon, even of the best quality, loses its flavor by exposure to light and air.

Lemon flavoring extract to be kept by the Subsistence Department, for sale to the officers and enlisted men of the Army, should be a saturated solution of fine hand-pressed oil of lemon in fine alcohol.

The facility with which the strength of alcohol and the quality of oil of lemon can be varied, and the facility with which they can, when thus varied, be combined in any desired proportions, contribute largely to the production of the many inferior brands of lemon flavoring extract to be found in the market.

The best simple test for determining the quality of lemon flavoring extract, and that is not conclusive, is to put a small quantity (a few drops) in a teacup, pour on it one-fourth of a cupful of boiling-hot water, and test the vapor for odor, and,

when sufficiently cool, taste the dilution for flavor—comparing with the standard similarly prepared.

The proportions of alcohol and oil of lemon can be determined by chemical analysis.

For Army use, lemon flavoring extract is required to be put up in 2-ounce bottles, twenty-four to the case.

FLAVORING EXTRACT, VANILLA.

Vanilla flavoring extract is an alcoholic solution of vanillin, slightly sweetened with sugar.

Vanillin is a white crystalline substance found in the bean of the vanilla plant, an orchid indigenous to Eastern Mexico, but which is now cultivated in some of the West India Islands, in the Island of Bourbon and the Island of Madagascar, and also in some of the East India Islands.

The Mexican vanilla beans are the best and the Bourbon the next best.

An artificial vanillin is made from coniferin, which is obtained from the sapwood of the pine tree. Although the artificial vanillin is identical in chemical composition with the natural product, it is not a satisfactory substitute for it in the manufacture of vanilla flavoring extract. It is, however, largely used in the manufacture of the numerous brands of inferior vanilla flavoring extract to be found in the market.

Vanilla flavoring extract of proper quality to be kept by the Subsistence Department, for sale to officers and enlisted men of the Army, should be the product of fine alcohol and fine Mexican vanilla beans.

The best test for determining the quality of vanilla flavoring extract, and that is not conclusive, is to put a small quantity (a few drops) in a teacup, pour on it one-fourth of a cupful of boiling-hot water, and test the vapor for odor, and when sufficiently cool, taste the dilution for flavor—comparing with the standard, similarly prepared.

For Army use vanilla flavoring extract is required to be put up in 2-ounce bottles, twenty-four to a case.

FLOUR.

Flour is the term used generally to designate the finely-ground meal of wheat or other cereal grains; but it is here

used specifically to designate the finer part of the meal of the wheat grain which is separated from the coarser part or bran in bolting.

There are two kinds of wheat, viz, spring wheat, so named because it is sown in the spring, and winter wheat, so named because, although sown in the fall, it is hardy enough to survive the winter. They are further distinguished by millers and merchants as "hard" and "soft," respectively.

The following are some of the marked differences in the structure of the grains of spring and winter wheats: The grains of spring wheat have a wide crease and a corrugated surface, affording convenient lodgment for dirt. The bran is of a dark color and friable. The grains of winter wheat have a narrow crease and usually a smooth surface. The bran is of a light color and has sufficient toughness to be easily separated from the flour.

Wheat is graded according to kind, plumpness, cleanliness, weight, and condition, as "No. 1 Spring," "No. 2 Spring," "No. 3 Spring," "No. 1 Winter," "No. 2 Winter," "No. 3 Winter," etc.

Wheat grading No. 1, being absolutely clean and virtually physically perfect, is very scarce. It is the best for seed.

Wheat grading No. 2, being reasonably clean and sufficiently near physically perfect for the purpose, is used in making the good flours of commerce. All wheat grading below No. 3 is immature or otherwise physically defective, or damp or otherwise out of good condition, or musty or otherwise damaged.

The cultivation of wheat has superseded that of all other grains in climates where it will thrive. In the Middle Ages it was food only for the wealthy classes, but its use has been constantly increasing until it is now food for all classes.

The reason seems to be that bread made from it has no unpleasant or pronounced taste, so that the most fastidious palate does not become tired of it. It has the light, spongy, or porous character which is so conspicuous in light or raised wheat bread. This adapts it for easy digestion, and is due to the peculiar nature of its gluten, which is very elastic. When moist dough of wheat flour is compressed, the elasticity of its

gluten component causes it to spring back and resume its form.

The quality of flour is dependent upon the variety of the wheat from which it is made, the curing of the ripened grain, and the milling.

The curing process is of the most importance, for if the grain is allowed to become damp and moldy a disagreeable flavor will be communicated to the flour, and its quality otherwise impaired.

To make good flour requires—

1st. Good wheat.

2d. A good mill.

3d. A good miller.

A combination of the above essentials will always produce good results, and the judgment of the miller will always point out any variation of practice that may be necessary under any conditions which may arise.

There is no infallible rule of practice in milling.

There are two processes of milling, which are known as "high milling" and "low milling." In early times the grains of wheat were brayed in a mortar, and later they were ground between two hard stones. Low milling is the grinding of grains of wheat between two large, round stones with radial grooves in their grinding faces, one revolving at such a small distance from the other as to crush the grains, which are caught as it were by the radial grooves and reduced to powder.

In this method of milling the wheat is sometimes moistened before grinding, as the grains are then more easily crushed and the bran is toughened.

The heat developed in grinding with millstones is considerable, the temperature of the meal as it comes from the stones being about 120° F.

This heating of the meal, it is thought, impairs the quality of the gluten by rendering it less tenacious and the flour less fit for making bread.

The heating of the meal and the grinding of portions of the husks so fine that they pass through the bolt with the flour are the chief objections to this method of milling.

High milling is a succession of crackings or slight and partial crushings of the wheat grains, alternating with the sifting and sorting of the meal.

The cracking or crushing machinery consists of a series of pairs or sets of two steel rolls, with corrugated surfaces, revolving, in close proximity to each other. The distances between the two rolls in successive sets differ very slightly, and are graded in a decreasing progression, so that the grains of wheat passing through the first set are merely cracked; the slightly cracked grains then feeding automatically into, and passing through, the next set, are slightly cracked or crushed again, and so on, for each succeeding set of rolls, to the end of the series.

The next step is the sifting and sorting. This is generally done by a series of sieves—each sieve being of finer mesh than the next preceding one, and the last, made of fine white silk cloth, called bolting cloth, the finest of all. The last sieve gives the finest flour and the coarser grades are left on the way.

The following account of a visit to a flour mill of modern design and equipment gives a very good idea of the process of high milling:

"The wheat is 'spouted' into the basement of the mill from the bins of the grain elevator, and then sent to the upper or seventh story by steam power.

"The first process is the sorting and cleaning of the wheat. Any bits of iron, nails, straws, or bits of wood, are thrown out as it passes through the cleaning machines. The seeds of cockle and other weeds, and the seeds of grasses, shriveled grains of the wheat itself, are all separated or sifted out. The wheat is passed between brush rollers, and all the dust removed from the creases and surfaces of the grains, so that when examined at this stage it appears plump, even-sized, and almost polished.

"In the next process the grains are cracked once longitudinally, *i. e.*, in a line with the creases; they are then crushed again, and then a third time. In the third crushing the husks are entirely freed from the flour components of the grains and are reduced to mere films.

"This method of successively cracking the grains is comparatively new; and, as a rule, takes out all the flour and leaves nothing in the husks. Here and there a husk could be picked out with an atom of flour adhering to it.

"The meal is now bolted through coarse sieves, which take out the husks or bran; the portion of the meal remaining is called 'middlings.'

"The middlings are ground and bolted five times, looking very much like flour the last time. This flour is then passed through fine sieves called bolts, which are cylindèrs revolving on horizontal axes. The bolts are mounted within large chests of appropriate size. On opening the chests to look at the sieves, a warm, sweet odor like that of new bread comes out of them.

"The following is a summary of the above-mentioned process:

"1. The grain is cleaned and assorted.
"2. The grain is cracked lengthwise.
"3. The grain is crushed.
"4. The grain is crushed again; the husk is now loose and the kernel crushed; the grain is reduced to meal.
"5. The meal is bolted, the result being bran and No. 1 middlings.
"6. Middlings No. 2.
"7. Middlings No. 3, finer still.
"8. Middlings No. 4, finer still.
"9. Middlings No. 5, finer still.
"10. Middlings are now like flour.
"11. This flour is ground once more and bolted.

"To be packed, the flour comes down through large cylindrical spouts into the barrels or sacks. The packing machines are nearly automatic. There are a number of them (proportioned to the capacity of the mill) arranged in two rows on the opposite sides of the packing room.

"When filled, the barrel or sack is placed on a scale and weighed, the weigher adding or taking out flour so as to make the weight exactly standard.

"Every improvement is added to insure safety in the mill, to lighten labor, and to increase the amount and improve the quality of the flour. Attached to the machinery are tubes, connected with exhaust fans, which draw away all the impalpable dust from around the roller, and also from the room. This fine dust becomes explosively inflammable when it is electrified, and it is liable to become electrified by contact with the high-speed revolving machinery of a flour mill. The great explosion a few years ago, in a flour mill at Minneapolis, Minn., is presumed to have been due to this cause, through ignition, by a bit of red-hot iron wire in the wheat, which became heated in passing through the rollers. This is one reason, also, for the extreme care used in cleaning the wheat before grinding, lest any bit of iron should pass through the machinery.

"The dust drawn from the air of the mill, with the sweepings from the boxes and shafts, is saved and used with the low-grade middlings in making the inferior grades of flour."

QUALITY OF THE GLUTEN.—One particular kind of wheat may be richer in gluten than another, but quantity of gluten does not compensate for inferiority of quality.

The quality of gluten is measured by its elasticity.

QUALITY OF THE STARCH.—The starch in flour should be of a white, or yellowish-white, color. If the starch is of a decidedly yellow color, it indicates that it has commenced to undergo chemical change, and that it is damaged.

THE BEST FLOUR FOR MAKING BREAD.—It has been found by experience that the best bread is made from flour containing from 10 to 18 per cent of gluten of good quality. Flour with too little gluten, or with gluten sufficient in quantity but deficient in quality, will make bread of inferior quality. Flour with an excessive proportion of gluten absorbs too much water in being made into dough, and is not essential to the making of good bread.

The relatively greater proportion of gluten in spring-wheat flour and its superior tenacity cause the dough to expand amply in rising, and give corresponding lightness to the bread. On the other hand, the relatively greater proportion of starch in winter-wheat flour, on account of the chemical

changes it undergoes during the fermentation of the dough, whereby a relatively greater proportion of sugar is produced and a relatively greater volume of carbonic-acid gas evolved, gives greater sweetness, and, possibly, greater lightness, to the bread.

While every barrel of flour purchased for Army use should be capable, when used by itself, as the exigencies of the service may sometimes require, of making a proper yield of good bread, the best flour for making bread, as will hereafter be explained, is not a single brand of spring-wheat flour or a single brand of winter-wheat flour, but a judicious mixture of one or more brands of the former with one or more brands of the latter, or of a flour made by combining, during the process of manufacture, several grades of good wheat.

WINTER-WHEAT AND SPRING-WHEAT FLOURS.—Many winter-wheat flours do not absorb as much water as flours made from the harder varieties of spring wheat, and consequently will make a less yield of bread than the latter. So far, however, as the other qualities are concerned, the fine winter-wheat flours are fully equal, and in some respects superior, to the fine spring-wheat flours. The strongest flour does not always make the most delicate, or the sweetest, or the most palatable bread.

SWEATING OF WHEAT AND FLOUR.—About the months of September and October, new-crop wheat and flour made therefrom undergo a natural change of condition by evolving a portion of the water contained in them, with a considerable rise of temperature. This action is called "sweating," and the change, "the sweat." In passing through the sweat wheat loses its softness, and becomes dry, hard, and flinty. While going through the sweat flour has a dark color, which, if souring does not supervene, gradually changes back to the original white, as the sweat passes off.

Flour made from new-crop wheat which has not passed through the sweat should be issued promptly, lest it become musty and a total loss.

It is good policy not to purchase any flour between the 1st of June and the 30th of November.

STRENGTH OF FLOUR.—The strength of flour depends on the amount and quality of the gluten it contains. The gluten is, in a greater or less degree, combined with the starch, and the greater the preponderance of the gluten over the starch, the greater the strength of the flour.

Weak flour can not be utilized for making bread otherwise than by mixing it, in proper proportion, with strong flour.

SPROUTED-WHEAT FLOUR.—Good flour can not be made from sprouted wheat, because such wheat has undergone more or less fermentation and thereby lost more or less of its fermenting elements and fermenting power; and, although it may have been given a good appearance by superior milling, it will not ferment readily or sufficiently in the process of bread making to make good bread.

Sprouted-wheat flour has the same general appearance as flour made too early from new-crop wheat. It feels heavy and appears dull, flat, and lifeless. The dough made from such flour has a rank odor, and the bread is clammy, heavy, dark-colored, and unwholesome.

EARTHY-SMELLING FLOUR.—Flour made from wheat which has been exposed to dampness while in the straw, after being harvested, has sometimes an earthy smell. This is caused by the wheat having been damaged by "heating," *i. e.*, by incipient fermentation, while in shocks or stacks, in the field. Sometimes nearly all flours from particular localities where especially damp seasons have prevailed at and after harvest time, have this earthy smell. Bread made from such flours is clammy, heavy, dark-colored, and unwholesome, but is not as bad as that made from sprouted-wheat flours.

SOURING OF FLOUR.—Flour ordinarily contains from 9 to 15 per cent of water, and, under the influence of heat, natural or artificial, not strong enough to expel the moisture, but strong enough to start fermentation, it will heat and sour, the action being a slow fermentation of the same character that leavened dough undergoes in the process of bread making. Flour, therefore, stored in a moist atmosphere, in warm or moderately warm weather, is liable to heat and sour.

GOOD-KEEPING FLOUR.—Winter-wheat flour is drier than spring-wheat flour and not so liable to sour, and, therefore, has the better keeping qualities. No flour, however, will have good keeping qualities unless it is made from sound and well-cleaned wheat.

VARIATION IN THE CHEMICAL COMPOSITION.—Flour, on account of the variation from the normal in the chemical composition of the wheat from which it is made, arising from the peculiarities of the kind of wheat, or of the peculiarities of the soil on which it was grown, or the meteorological conditions which prevailed during its growth, or a combination of two or more of these causes, will generally be deficient in some and redundant in other chemical elements essential to the production of good bread of proper nutritive value. These deficiencies and redundancies can, however, be substantially compensated and equalized by mixing, in proper proportions, one or more brands of spring-wheat flour with one or more brands of winter-wheat flour; or by mixing, in proper proportions, spring wheat taken from one or more lots with winter wheat taken from one or more lots, and milling the mixture.

The milling of a mixture of different kinds or different lots of wheat is, on account of the lack of uniformity in the size, shape, and density of the grain, somewhat difficult at many of the mills that are not equipped with improved machinery and conveniences; but many of the large mills are provided with a number of wheat bins, each containing different grades of wheat, all of which are under direct control of the miller, and from which he can draw wheat, during the process of making flour, in such proportions as he may desire.

Some wheat, owing to the soil and other conditions under which it is raised, may lack the necessary chemical properties for first-class flour; but these elements can be supplied to the flour, during the process of grinding, from wheat contained in the other bins. A good miller, provided with the proper facilities for so doing, can combine these elements in suitable proportion, and thus flour can be produced which is capable

of making good bread by itself. When such is the case, better bread can be produced for use at military posts where the bakers are not always possessed of the necessary skill to enable them to tell the qualities of the flour, or to determine upon the mixture in which to properly blend two or more brands that will produce the best results.

In large bakeries, where skilled bakers are employed, the baker should exercise full control over the flour, and if the mixture of two or more brands should prove to make better bread than the use of a single brand, such a practice is advisable, but just as good results may be obtained by using flour that is properly made from various characters of wheat as by trusting to the judgment of the bakers usually detailed at the posts.

It is also difficult to make issues, in proper proportions, of flour where but ten or fifteen rations are drawn, if, as frequently happens, two, three, and even four grades are required; and to those who need only small quantities the proportions are not followed in the issues, and they are frequently unable to make good bread from the one grade usually issued in such cases.

To make bread of proper nutritive value and wholesomeness "straight" flour, *i. e.*, flour containing all the elements of the fully-developed wheat grain, except the husk or bran, is essential; and such flour only should be purchased for issue as a component of the Army ration.

Mode of Packing Flour.—Whether flour should be packed warm or cold is yet a disputed point; also whether it should be packed tight or loose is yet unsettled, with facts in favor of the latter mode. Much United States flour is sent to England in sacks. Extra-tight packing has, in some instances, proved a failure—the flour having caked much. Caking also occurs in the packages in the lower tiers, if flour is piled too high.

Experience has shown that flour put up in sacks need not be so tightly pressed, and does not sour so readily, as that put up in barrels. On the other hand, it is objected that flour put up in sacks is more exposed to the damaging effects of foul air, dampness, and heat, than flour put up in barrels.

STORAGE.—Flour keeps best in cool, dry, and well-ventilated storage. In summer, it should not be stored in either a cellar or a garret, but in a room, preferably in the second or third story, where there is a full and free circulation of air. It keeps best in a moderate, equable temperature, and should not be exposed to a freezing temperature, nor to an intense summer heat or equivalent artificial heat, for any great length of time. It should not be stored with grain or other articles which are liable to heat. It is peculiarly sensitive to exhalations from other substances, and, therefore, should not be stored in the same room with sour liquids, vegetables, fish, or any other articles that emit unsavory or noxious exhalations, nor in close proximity to kerosene, coffee, or tobacco.

BRANDS OF FLOUR.—Under the laws and regulations governing the purchase of public property, competition among bidders for furnishing flour is limited to specified *grades*, and the purchase of particular brands is, therefore, impracticable.

Flour brands are of three classes, viz, mill brands, private brands, and bastard brands. Mill brands have the name of the miller, milling firm, or milling corporation, owning the same, incorporated therewith or annexed thereto. Private brands, likewise, have the name of the merchant, mercantile firm, or mercantile corporation, incorporated therewith or annexed thereto. Bastard brands do not have the names of owners incorporated therewith or annexed thereto. Mill brands are used by millers on their good grades of flour; private brands, by merchants, also, on good grades of flour; and bastard brands, by millers on their poor grades of flour.

Not all mill brands, nor perhaps all private brands, are kept up to their original standard of quality. After having become well established in public favor, they are, sometimes, without reducing prices, gradually lowered in quality, making them of cheaper and cheaper, and, consequently, poorer and poorer, wheat, in a manner quite imperceptible to the generality of customers. Therefore, brands are not an unerring index of the quality of flour, and the only safe reliance is inspection.

Flour without brand, or irregularly branded with letters, numbers, etc., should be subjected to rigid scrutiny.

UNIFORMITY IN QUALITY OF MILL BRANDS OF FLOUR.—The marked uniformity in the goodness, or quality, of some mill brands of flour is maintained by constant care in selecting and milling the wheat, and by careful inspection of each package of flour before it leaves the mill. The inspection of the flour is not superficial only, but thorough and conclusive, involving the use of the microscope and the water tests.

EFFECTS OF AGE ON WHEAT AND FLOUR.—Wheat improves in quality as its age increases, until it passes through the "sweat." It then retains its quality, and does not undergo any noticeable changes for a very long time. On the other hand, while flour improves in bread-making qualities as its age increases, for some time after it is made, and should be at least thirty days old before being used for making bread, it reaches a stage in three or four months beyond which it does not so improve; and, while it retains its acquired good qualities for a longer or shorter period, it eventually begins to deteriorate seriously. Animal and vegetable parasites appear in it—among the former, mites, vibriones, and the larvæ of insects; and among the latter, several species of fungi. The presence of mites and vibriones, which can readily be detected with the microscope, almost always indicates decomposition of the gluten, and consequent deterioration of the flour. The fungi have the reputation of causing intestinal irritation in the persons who eat the bread made from flour containing them.

One of the most important features of the deterioration which flour undergoes by being kept on hand too long is acidity. This acidity, which is very slight in recently made flour, increases rapidly and progressively with the increase in the age of the flour. Under ordinary conditions, the period of good preservation of flour does not extend beyond a few months.

The slight acidity noticeable in old wheat, particularly in old wheat of the hard varieties, which contain less water than the soft varieties, is in very strong contrast with the high degree of acidity found in old flour. Experiments recently

made by M. Ballaud, a prominent French chemist, with wheat that had been kept for ten years, showed that its acidity differed little from that of new wheat.

The relative effects of age on wheat and flour indicate that flour should not be accumulated in very large quantities or kept on hand for any long period of time, and that the reserve supply of breadstuff should be in wheat instead of flour.

METHODS OF TESTING FLOUR.—Flour testing, like tea testing, is an acquirement. It requires long practice to judge of the quality of flour by its shade of yellow, its mode of caking, when pressed, or other characteristics.

There are two classes of tests for the quality of flour, viz, dry tests and the water tests.

DRY TESTS.—The dry tests are as follows:

By Color.—Flour should be of a warm white color—not a chalky white. The latter would indicate deficiency in strength from overgrinding, which removes too much of the gluten, destroys the proper proportion between the gluten and starch, and brings the latter into too great prominence. An approach to this condition is more noticeable in "Patent" or "Family" flour, which goes through four or more processes of grinding, than in "Straight" or "Issue" flour. Flour should not have a bluish tinge, as this would indicate the presence of cockle seed, a small, black seed borne by a plant or weed that grows among wheat, or smut, the result of a fungus disease to which wheat is liable. Flour should not have any tinge away from a warm white. An exception to this is the Walla-Walla flour, which, although quite yellow, is of excellent quality. This test requires the ability to distinguish delicate shades of color. The color that flour will give to bread made therefrom will be shown by placing a flattened ball of dough made therefrom on a piece of clean, colorless window glass, and allowing it to stand for twenty-four hours, when, by looking at the bottom of the ball of dough through the glass on which it rests, the color will be seen.

By Comparative Color.—When flour is to be inspected for acceptance under a contract, the inspector should have with him a portion of the sample upon which it was purchased, in

order to make comparison between the former and the latter. To do this, about one handful each of the sample and the flour to be inspected are placed on a piece of smooth board, about 15 inches long and 6 inches wide, the two piles about 2½ inches apart, and so placed that no part of one shall run into the other; both of these piles are then flattened with an ivory spatula made for the purpose, or with an ivory paper cutter, if necessary; two parallel cuts perpendicular to the sides of the board are then made through each pile, at its sides, the flour thus cut off being slightly moved with the edge of the spatula from the flattened pile to which it belonged; this is for the purpose of loosening this separate portion from its hold on the board, when, by tipping the board a little more than forty-five degrees toward the inspector, it will be found that the flattened piles will retain their position, while the four loosened parts will slide off, leaving two masses whose inner and outer edges are parallel. Then place the spatula, with its edge closely against the now horizontal board, and in contact with the outer edge of the right-hand pile, and by a steady pressure slide it to the left until its inner edge comes in contact with the inner edge of the left-hand pile; draw the flat of the spatula toward you, with but slight pressure over the line of juncture of the two flours, take to the light, and, by tipping the board backward and forward slightly, the difference of color between the sample and the flour offered, if such a difference exists, will be readily seen at the line of contact of the two flours.

For Cleanliness.—To detect dirt or foreign substances, as much of the flour as can be held in the hand should be placed on a smooth piece of paper and flattened with an ivory spatula, and the pile separated into parts by a downward cut of the edge of the spatula, the different sections of the pile being then slightly separated by a side movement. Any dirt or foreign substance can be readily detected by the aid of a magnifying glass, or even with the naked eye, the dirt showing in specks, and foreign or unground substances leaving little tracks behind them when forced down by the edge of the spatula, such as a snowball makes when being rolled.

By Smell and Taste.—If flour does not have the taste of sound, freshly ground wheat meal, or if it has a sour taste, or a musty, moldy, or earthy taste or odor, however slight, it is unsound, and should be rejected.

For Dampness.—When flour is damp it should be rejected without question. This condition is indicated by the possibility of rolling a pellet of it between the thumb and finger, or by the general feeling of moisture perceptible in running the open hand through it.

For Strength.—The strength of flour may be determined, in a general way, by pinching it between the thumb and fingers as it lies in a pile or in an open sack. When it is pinched, it should retain the pyramidal form, instead of crumbling as soon as the pressure is removed. Before using this test, the absence of moisture should first be determined by the foregoing test for dampness. The property of sticking to a perpendicular, flat surface, when thrown against it, is also indicative of strength in flour, but the best test for strength will be given hereafter, among the water tests.

For Texture.—Take in one hand a small portion of flour from the sample, and in the other hand a like portion from the lot of flour to be inspected; rub these two small portions of flour at the same time between the thumbs and forefingers of the two hands, respectively, and if there is any defect in the texture of the latter portion of flour, it will be apparent in the difference of feeling. This test, however, is not a very valuable one in the hands of a novice, but is a very valuable one in the hands of an expert; not alone to determine the texture of flour, but also to discover whether it has been made from good, sound wheat or not. An oily, soapstony feeling, or the absence of granulation, indicates that the flour was made from tailings, sweepings, or from wheat that had commenced to sprout.

WATER TESTS.—Water tests are the most perfect methods of determining the quality of flour and are almost, if not wholly, infallible when properly made in connection with the dry tests for cleanliness, mustiness, sweetness, etc. They are as follows:

For Strength.—The strength of flour, which, as has been stated, depends on the amount and quality of its gluten, can be determined indirectly, with a sufficient degree of approximation for practical purposes, by the elasticity and other characteristics of its dough. To do this, two ounces of the flour are mixed with one fluid ounce of water (good flour absorbs water in about this proportion), and the mixture is kneaded until all of the flour is incorporated into the dough. The dough is then molded with the hands and fingers into the form of a biscuit, about 2½ inches thick and 1¾ inches in diameter, with a flat top and a flat bottom. It is then placed on a plate, or on any flat surface, and allowed to remain there for thirty minutes. If it stands up and retains its form well, and has acquired a hardened, dry surface, or "crust," it is an evidence that the gluten is sufficient in quantity and quality, and that the flour is of proper strength. If it falls and flattens, or "runs," it is an evidence that the gluten is deficient in quantity or quality, or both, and that the flour is deficient in strength. If dough which has stood the preceding tests satisfactorily is taken into the hands, and, by gently pulling it around the edge, is flattened out and stretched until it is so thin as to be transparent, and does not tear in the operation, it will be a further evidence of the sufficiency of the quantity and quality of the gluten, and of the sufficiency of the strength of the flour. Then, if the dough which has stood the foregoing tests satisfactorily is made into a roll about 5 inches long, and the ends pulled gently with the two hands and the tension relaxed, and the roll retracts itself and resumes its former shape, it is a further evidence of sufficiency in the quantity and quality of the gluten, and of the sufficiency of the strength of the flour.

Another water-test method of determining the strength of flour from the amount and quality of its gluten, commonly called "extracting the gluten," is as follows, viz:

1. Weigh out, with a troy scale, 1 ounce of the flour.

2. Measure out, in a graduated glass, 4 fluid drams of water, if the sample to be examined is winter-wheat flour, or 4½ fluid drams if it is spring-wheat flour.

3. Add the measured water, little by little, to the weighed flour, at the same time working the mixture into a ball of dough.

4. Place the ball of dough between the palms of the hands and interlock the fingers; submerge the ball of dough thus held in a bucket of water, and then work the dough, by opening and closing the hands, until all of the starch is washed out of it, which will be indicated by the absence of a milky color in the escaping water. What then remains in the hands of the operator is hydrated gluten, which, if the flour is of proper strength for making good bread, will be of a clear, brownish-yellow color, very elastic, and weigh from 140 to 190 grains. Without the latter yield, unless the gluten possesses superior elasticity, the flour is deficient in strength.

Badly ground or badly bolted flour, or flour made from moist or damaged wheat, yields less than the minimum quantity of hydrated gluten above stated. Such gluten has a grayish-brown color, an admixture of more or less fine bran, and is deficient in elasticity.

For Smell and Taste.—Uncontaminated, sound flour has the taste of the freshly ground meal of sound wheat. To determine whether sound flour has absorbed any foreign odor or not, place a small portion of it (3 or 4 ounces) on a plate, pour boiling-hot water on it, and inhale the vapor. If the flour is contaminated with any foreign odor it will be readily detected in the vapor.

General Remarks.—In low milling, wheat yields about 80 per cent of flour of all grades, the lowest grade differing little from the highest. In high milling the yield is greater, but only about 45 per cent of it is of the highest grade, and the balance is divided among several lower grades differing much from the highest. The flour is not heated, and therefore not injured, in high milling, because it is not subjected to the great friction in grinding which characterizes low milling. In high milling, the separation of the non-nutritious part of the grain, *i. e.*, the husk or bran, from the highly nutritious phosphatic nitrogenous elements contained in the outermost layer of cells next to the husk is more complete, and the

yield of flour correspondingly greater in quantity and richer in quality than in low milling. The flour is also white, because it is free from particles of bran, and drier, and therefore of better keeping qualities, because the wheat is not moistened preparatory to milling.

The art of high milling has reached such a degree of perfection that, by its perversion, flour can, at the will of the miller, be robbed of its gluten to any desired extent, even until it is nearly as white and destitute of nutritive elements and bread-making properties as laundry starch, from which it then does not very much differ in chemical composition.

Robbed flour can be detected by any of the methods heretofore given for determining the strength of flour.

Good flour contains—

	Per cent.
Water	13.0
Fibrin, etc	10.5
Starch, etc	74.3
Fat	0.8
Cellulose	0.7
Mineral matter	0.7
Total	100.0

These constituents are so proportioned as to render the bread made from flour a highly nutritious, palatable, and wholesome food, capable, by itself, of sustaining the life and health of man.

FRUITS, CANNED.

The arrangement of a cannery is a matter of adaptation and convenience, and may be more or less elaborate, according to its capacity. The model cannery is one in which everything moves on a continuous line through the various stages of the process, so that one department does not interfere with another; the work being carefully divided and systematized with a view to convenience and economy.

The first operation is that of sorting and grading the fruit according to size and quality, rejecting all that is overripe, unsound, or in any way objectionable, and keeping each variety by itself. The sound fruit is then passed to the peelers and cutters, who prepare it for packing in the cans.

Nothing is thrown away at this stage, the waste being used in the manufacture of jellies and fruit butter, or for distilling; even the seeds are utilized, being sold to nurserymen and manufacturers of chemicals.

The fruit is then packed in cans of uniform size. The cans are then passed to the fillers, who fill them with the proper quantity of fruit. If the fruit is apples, a sufficient quantity of water to fill the interstices is added to each can after it is filled with the prepared fruit; or, if it is apricots, peaches, or pears, a sufficient quantity of refined cane sugar to neutralize the natural acidity of the fruit is put into the can. The filled cans are then passed to the cappers and hermetically sealed, after which they are placed in boiling water and processed. The time of processing varies from 3½ to 4½ minutes, according to the kind of fruit. Each can is then punctured with an awl to allow the steam and air to escape, and the puncture at once closed with a drop of solder. The cans are then returned to the process tank and reprocessed for from 4½ to 5½ minutes, according to the kind of fruit, after which they are again withdrawn and arranged on the cooling tables. Next day, when entirely cool, the cans are tested for leaks by tapping them with a steel rod, and the defective cans removed. The cans are then labeled, packed in cases, and placed in the storeroom, where they remain at least thirty days before handling or shipping.

The defects most common in canned fruits are:

1. *Fermentation.*—Indicated by swelling of the cans.

2. *Inferiority of the quality of tin used in making the cans.*—Indicated by a dull leaden appearance and light weight of cans when empty.

3. *Inferiority of quality of fruit or sirup, or both.*—Indicated by their appearance and taste.

4. *Lack of aroma and flavor*, resulting from unsuitableness of variety of fruit, errors in process of canning, underripe or unsound fruit, etc.—Indicated by taste and odor.

INSPECTION OF SAMPLES OF CANNED FRUIT.—Arrange the sample cans of fruit by themselves on a table, in the order of the bids to which they respectively pertain, and then proceed as follows:

1. Weigh the sample cans in regular order, and enter on an abstract of proper form the number of bid, name of bidder, brand, gross weight of can, and price.

2. Open the sample cans in their regular order, draining off the sirup into a white bowl, leaving the fruit in the can. As many white bowls are required as there are samples. White bowls are used to facilitate the determination of color and clearness. Weigh the cans and the fruit, with the sirup drained off, and enter the weight on the abstract.

3. Examine the fruit of each sample, and note on the abstract impressions as to size, color, appearance, and flavor.

4. Examine the sirup for color, clearness, flavor, and density, and note on the abstract impressions with respect thereto. In determining the density of the sirup, use an ordinary glass test tube, with saccharometer.

It must be remembered that in the processing the sirup is reduced about one-third in density by water drawn from the fruit, the latter absorbing a certain proportion of sugar from the original sirup. The saccharometer will therefore indicate about two-thirds the original density of the sirup.

5. Observe the quality of the tin used in making the cans. If the cans have a dull, leaden appearance, reject them at once. Cans should not be made of tin inferior to that known as 108-pound, *i. e.*, tin weighing 108 pounds to the box of 112 sheets. All cans should be soldered on the outside. Inside soldering is dangerous, as the lead coming in contact with the fruit acids is likely to poison the contents of the can.

6. And, finally, reject all fictitious, irresponsible, or exorbitant bids, or bids based on samples not of proper quality; accept the lowest remaining bids for the articles, respectively, and make proper notations on the abstract.

The notes should be filed with the retained copy of the abstract of proposals, for future reference.

INSPECTION OF CANNED FRUITS ON DELIVERY BY CONTRACTORS.—1. Examine a sufficient number of cans taken at random from each lot of an article, comparing results with the notes taken when the samples were examined. If the fruit is equal in quality to the sample, and is in proper condition, proceed to examine the cases. Cases for canned goods should

be made of clear, seasoned lumber—sides, tops, and bottoms $\frac{3}{8}$ inch and ends $\frac{7}{8}$ inch thick, all dressed on the outer side. They should be well made, and at least thirty-two 5-penny wire nails should be used in nailing each case. Strapping should be required when goods are to be shipped over a long wagon route.

2. See that the branding or stenciling is done in accordance with regulations.

The shipping weight of cases containing twenty-four $2\frac{1}{2}$-pound cans of peaches, etc., is from 65 pounds to 67 pounds; that of cases containing twenty-four 2-pound cans of jellies or jams, from 50 pounds to 53 pounds.

(See "Apples, canned;" "Apricots, canned;" "Peaches, canned;" and "Pears, canned.")

FRUITS, EVAPORATED.

Evaporated fruits are fruits dried or evaporated by the Alden process.

This process was first used on a large scale in this country, in California, about twenty years ago, but its use has since spread eastward, and revolutionized the fruit-drying industry of the whole country.

It is a hot-blast process, and its operation is to remove the water from the fruits rapidly and convert a portion of their starch into sugar, without much impairing their flavor or changing their appearance.

In the sun-drying process, which is a slow, still-heat process, the fruits undergo more or less fermentation, sustain a corresponding diminution of sugar and impairment of flavor and appearance, and, being exposed for several days in the open air, flies deposit eggs on them, from which, under favorable conditions, worms are hatched.

In the oven-drying process, which is also a still-heat process, the outer surface of the fruit dries first, thereby preventing the escape of the internal moisture and inducing fermentation and decay. There is a considerable development of dextrin, a gummy substance which causes toughness and impairs flavor. It is generally conceded, therefore, that the "still-heat" processes do not give the best results, and that the

hot-blast or Alden process, with its greater penetrating power and rapidity of action, has the effect of preventing, instead of inducing, decay, and of preserving, instead of destroying, the color and flavor of the fruit.

Evaporated fruit possesses remarkable keeping qualities, being capable, even after having been kept for years, of regaining its natural form and flavor if soaked for a few hours in water, and then boiled with an abundant addition of water.

The process of evaporating fruit does not require great technical skill. The machine for evaporating fruit consists of a hollow shaft or tower, in which fresh fruit, containing from 80 to 90 per cent of water, is arranged in moving trays. Beneath is a furnace, which supplies a strong current of hot, dry air (from 194° to 212° F.), which, passing up through the tower, vaporizes and absorbs the water of the fruit, and carries it off into the outer atmosphere. During this process the fruit is continually surrounded by the developed vapor, which prevents scorching and keeps the pores of the fruit open until the required degree of dryness is reached. The current of hot air is then turned off, and the processed fruit taken from the tower and spread out in an airy room to dry off its surface moisture. The windows and doors of the drying room are carefully covered with screens to keep out flies and insects. When thoroughly dry, the fruit is pressed into paper-lined wooden boxes, which are then nailed up. It is then ready for market.

The process of "sulphuring" dried fruits consists in exposing them, in a confined place, to the fumes of burning sulphur, for the purpose of bleaching and brightening their surface and arresting discoloration. The moderate sulphuring of dried fruits has, perhaps, no injurious effect on them; but, if it is overdone, it detracts from their appearance and flavor and gives them an unnatural white color and an insipid taste. Sulphuring evaporated fruits is unnecessary.

(See "Apples, evaporated," and "Peaches, evaporated.")

GELATIN.

Gelatin is a semi-solid substance of soft, tremulous consistency, obtained from certain parts of the animal body, such as

the white fibrous tissue, the skin, and the cartilage, by boiling them with water.

The substance, as it usually exists, contains much water, which may be dried out, leaving a brittle, glossy mass, which is the gelatin of commerce, and also the gelatin kept by the Subsistence Department for sale to officers and enlisted men of the Army.

The ordinary gelatin of commerce is made from those pieces of skins which are cut off by the tanner as unfit for making leather, in consequence of too great thickness; but the best gelatin is made from the skins of calves' heads.

The skins of the heads are cut off from the whole calfskins after they have passed through the process of liming, to remove the hair from them. The calves'-head skins are next well washed, to remove the lime, and all the pieces of flesh and fat are carefully cut out. Some manufacturers soak the skins for a short time in a dilute solution of muriatic acid, to remove any remaining portion of lime; but this practice is injurious, and, therefore, is not to be recommended. The muriatic acid forms, with the lime, chloride of calcium, which, if not carefully removed by washing, is boiled up with the skins, and, being soluble, remains in the gelatin. A portion of the skins is also dissolved by the acid and is thrown away in the water used in washing them, which thus occasions a loss in yield of gelatin.

In some cases the skins are boiled whole; in others they are cut into fine pieces, or even reduced to pulp by a machine especially constructed for the purpose.

If the skins are cut into fine pieces, instead of being put into the boiler whole, the gelatin will have a lighter color and better appearance, and the process will be more economical, as one-half of the time required for the boiling, and a corresponding proportion of fuel, will be saved. As the gelatin is darkened by prolonged boiling, reduction of the skins to a pulp is of very great importance.

There are several methods of manufacturing gelatin, but only one will be here described. It is one of the best, however, and is as follows, viz:

The hair is removed from the calves'-head skins, and they are well washed, as above indicated. They are then cut into small pieces by hand and are reduced to a pulp by a machine. The pulp is then boiled with water, in the proportion of about 1 gallon of water to 7 pounds of pulp—a small quantity of salt being added to preserve the gelatin. After boiling for about twelve hours, the mixture, which now consists of hydrated gelatin and the excess of water, is strained, and the hydrated gelatin thus procured. The hydrated gelatin is clarified with ox blood or white of eggs, and drawn off into shallow coolers to congeal. As soon as it is solid, it is cut into strips and laid on wire nets to dry, in a room heated to a temperature of about 80° F. If the temperature of the drying room is too low, air bubbles form on the surface of the gelatin. When the strips of gelatin are properly dried, they are cut into small rectangular pieces by a machine.

The pieces are put up into packages containing 1 ounce, 2 ounces, 3 ounces, and 4 ounces, respectively.

Gelatin is colorless, transparent, inodorous, and has an insipid taste. It may be tested for admixtures of glue by dissolving it in hot water, as glue, if present, will then reveal itself by its characteristic odor.

The chemical composition of commercial gelatin is, by weight, as follows, viz:

	Per cent.
Carbon	50.05
Hydrogen	6.90
Nitrogen	17.40
Oxygen	25.65
Total	100.00

Gelatin is used to a considerable extent as food, most commonly in the form of soup, but it has not a high nutritive value.

HAMS.

In the commercial sense, a ham is the thigh of a hog cured by pickling and smoking.

Standard hams are cut short, are well rounded at the butt, and are properly faced. The legs are cut off at or above the hock joint.

Hams, after being cut and trimmed, are, in a chill room, laid on a rack with the shank ends down, and chilled to a temperature of 36° F.; they are then placed in vats and covered with pickle, having a strength or density of from 76° to 80° Baumé, prepared with sugar, saltpeter, salt, and water, and kept there from sixty to ninety days, according to the size of the hams and the degree of the curing desired. The hams are turned over two or three times during the curing, and, when taken out, are washed in warm water, hung in the smokehouse, and allowed to drain ten hours. They are then smoked two or three days, and left hanging one day to dry. They are then ready for use. The curing of hams requires great care, as all the details of the process must be strictly attended to.

If hams are highly cured, *i. e.*, made very salt, mold will not grow on them. The presence of mold on hams, therefore, is evidence of mild curing; and mild-cured hams are considered to be the best. If uncanvased hams become moldy, the mold should be washed off in warm water, and the hams hung up where they will dry quickly; and, if it is desired to renew their freshly smoked appearance, they should, when dry, be rubbed with glycerin. There is no method of preventing mold, except by hard salt curing, which spoils the hams. Cheese usually molds, but it is not generally understood that mold impairs its food qualities or its flavor.

Sugar-cured hams are mild-cured hams, and, whether canvased or uncanvased, mold readily in warm or moderately warm, moist weather. Canvased hams always show more or less mold after being kept on hand one or two months, but it seldom improves the flavor of the meat.

Mold is of extraneous origin, and its presence on meat is not an indication of putrification or decay. It consists in minute parasitic plants derived from spores deposited on the meat from the atmosphere.

Uncanvased hams should not be kept on hand between April 15 and November 1, which is the season for flies. Flies will go wherever meat is accessible and deposit their eggs upon it, and these, under favorable conditions, will hatch and produce swarms of maggots and ruin the meat.

For commercial purposes hams are generally put up in tierces; but for Army use they are generally required to be put up in crates, each crate containing about 100 pounds, net.

Sugar-cured hams only are kept by the Subsistence Department for sale to officers and enlisted men of the Army.

The milder-cured hams are generally preferred, but in many cases specified brands are called for, and it is not easy to meet the various tastes of the consumers.

To make a selection as to quality from among several hams submitted as samples with bids, two or three slices should be similarly cut from the middle of each ham, and each set of slices cooked separately but similarly; and all of the slices, when cooked, tasted.

Hams for Army use are generally inspected as to size, cut, trimming, cure, and condition, before they are canvased; and afterwards, for canvasing, packages, packing, and marking. If hams are inspected after they are canvased, the hole made in the canvas by the trier should be stopped with paste, mixed with yellow wash.

The following rules for selecting hams were published by a well-known packing house:

"*First.* Never buy a ham because it is offered at a low price. Cheapness counts one against its being choice.

"*Second.* Do not select too lean a ham. The fat of a ham is often considered so much waste weight; so it may be, in many families, but one would not select a very lean piece of beef for roasting; it would surely be dry and tough when cooked. A well-fed and quickly fatted pig will furnish tender, juicy, and fine-flavored meat; and if you will bear this in mind you will be willing to lose a little extra fat for your gain in the superior qualities of every other ounce of the meat. Let the ham be well rounded and plump, rather than thin and flat, and see that the skin is thin and pliable.

"*Third.* Choose freshly cured hams. Formerly the year's supply of hams was cured in the winter, and, after being smoked, the hams had to be canvased to protect them from the ravages of flies, and in this shape they were carried through the summer and fall, to meet the current demands of those seasons. This necessarily resulted in a considerable loss of

the juices of the hams by evaporation, while they gradually became so densely covered with mold as to injure their flavor. By the present method of curing in chill rooms, hams of the finest quality are cured even in the hottest weather, so that now the market affords newly cured hams throughout the year.

"Cured meats do not improve with age. The more recently they have been cured the better they are when cooked."

HAM, DEVILED.

To Make Deviled Ham.—Fresh hams are cured in a sweet pickle, made according to the same formula as that used for making the sweet pickle for curing sugar-cured hams. The hams, when properly cured, are removed from the pickle, and, after being washed, are cooked by boiling. They are then carefully trimmed, and the meat stripped from the bone and run through a machine that minces it very fine. The condiments are then added and the minced meat run through another machine, which mixes the condiments therewith and fills it into cans.

Deviled ham should be prepared in cool weather only.

It is put up in ¼-pound cans, forty-eight to a case, and ½-pound cans, twenty-four to a case.

Imitation deviled ham is made of the waste scraps of meat (beef as well as pork) that accumulate in packing houses. Its low price and poor flavor are sufficient indexes of its character.

HANDKERCHIEFS, LINEN.

In determining the quality of linen handkerchiefs it is customary in the trade to use a magnifying glass made for the purpose, called a linen glass, to ascertain the number of threads to the inch, also the perfection or imperfection of their twist.

Handkerchiefs of different makes may have the same number of threads to the inch, but upon close examination there may nevertheless be found a great difference in the manner in which the threads are woven, finished, and twisted. A fine handkerchief will show the threads well twisted, perfectly

finished, with a smooth surface and very closely woven, without any loose ends protruding.

Those commonly woven show about 76 threads to the inch and are about 20 inches square.

The best handkerchiefs are made in England, from Irish flax.

The commercial subpackages are shallow paper boxes containing various quantities—six, twelve, or more handkerchiefs each.

HANDKERCHIEFS, SILK.

The quality of silk handkerchiefs is determined in the same manner as that of linen handkerchiefs, but they, of course, have a greater number of threads to the inch. Those generally purchased have about 92 threads to the inch, and are about 24 inches square.

They are packed in shallow paper boxes containing twelve handkerchiefs each.

HARD BREAD.

Hard bread, sometimes called pilot bread, is a variety of water cracker. It is generally made of flour and water only. Salt is sometimes added, at the rate of 1¼ pounds to each 100 pounds of flour. While salt improves the taste of hard bread it increases its liability to absorb water and impairs its keeping qualities.

The flour should contain little or no bran, as, on account of the hygroscopic qualities of bran, hard bread containing it is very liable to rapid deterioration from mold. When flour containing bran must be used, no salt should then, under any circumstances, be used.

No artificial agency being used to lighten hard bread, the flour must possess of itself sufficient strength to give the bread the necessary porosity or "spring."

TO MAKE HARD BREAD.—The selected flour is mixed with sufficient water to make a dry dough; the dough is then put into the kneading machine and thoroughly worked; it is then run through the "break," and then through the cutter, which cuts the sheets of dough into cakes ready for baking. The cakes are then transferred to the ovens, where they bake

very quickly. The thickness of the cakes is very important; they should not be so thick as to prevent them from drying properly, nor so thin as not to have the proper strength to prevent them from crumbling in transportation.

The quantity of water required for use in making the dough varies with the nature of the different flours. If the hard bread is intended for immediate use, from 1 to 2 pounds of salt may be added to each barrel of flour, but the quantity should be diminished as the length of time for keeping the hard bread on hand increases.

Good hard bread is of light-yellow color. When struck, it should give a clear, almost ringing sound, and it should readily and thoroughly soften in the mouth.

The quality of hard bread varies with the grades of flour used. The baker should, therefore, make a careful selection of the flour to be used.

Hard bread should not contain more than 12 per cent of water. The nutritive value of 1 pound of hard bread is equal to 1⅛ pounds of soft bread made from the same flour.

Hard bread is made in square or round cakes, and is put up in packages to suit purchasers. If either the hard bread or the boxes are not thoroughly dried, the hard bread is liable to mold; both should, therefore, be kiln-dried. If liable to be taken on a sea voyage, or to be kept for a long time, it should be put up in 48-pound hermetically sealed tins, packed in crates, two tins to a crate.

When packed in the ordinary way, *i. e.*, in wooden boxes, it should be stored in a dry place, and issued before it is one year old.

If weevils make their appearance in hard bread, they can be exterminated, without much injury to it, by putting it into a bake oven and subjecting it to a temperature of 325° F. for thirty minutes; or by spreading it out on sheets or tarpaulins and exposing it to the sun for three or four hours.

Hard bread possesses many advantages, as being easily transportable, and being, bulk for bulk, more nutritious than soft bread, is the most practicable food now obtainable. On the other hand, its use is not free from grave objections. It is deficient in fat, after a time it seems difficult of digestion, and

certain it is that men do not thrive well upon it for long periods. It should be issued only in cases where it can not be avoided.

It is difficult to masticate the tough morsels, and the only remedy is to steep them in water, coffee, or soup, which is not always practicable. If eaten in the dry state and insufficiently triturated, the hard, angular fragments act as a mechanical irritant and cause diarrhea.

The French have for the past few years endeavored to replace hard bread by a "*pain de guerre.*" At first an attempt was made to desiccate the ammunition bread, but the plan had to be abandoned. It was found, after exhaustive experiments in the military bake-houses, that in order to reduce the water in a loaf weighing 750 grammes (26 ounces) to 12 or 14 per cent, a period of between 30 and 40 days was required; and move-over, that when the residuum was remoistened for use, its edible qualities were far from satisfactory. Private enterprise was enlisted, the result being a long series of failures, all more or less complete. At last, in December, 1892, the Administration resolved on making an extended trial of the compressed bread of Perrier, and a large quantity was issued to the Army. After a two-years' trial, in both France and Algeria, the reports called for were fairly favorable, but before coming to a definite conclusion in the matter the Minister of War issued a circular, dated April 10, 1894, calling on all persons engaged in the baking trade to enter into competition for the production of a war bread, that is to say, "a substance occupying very small space, but including, nevertheless, the whole of the qualities, nutritive and digestive, of ordinary bread." According to the terms of the circular, the required product was to keep good for a year, without manifesting the slightest sign of deterioration. Its dimensions should admit of its being packed in the soldier's valise, and its substance should be sufficiently resistant to withstand the shocks and compression of ordinary transportation. The materials used were to consist exclusively of soft wheaten flour, leaven, water, and salt. In shape each piece was to be square or rectangular, with a due proportion of crust; the crumb was to be white and porous; and both the taste and smell agreeable to the senses. Finally,

the dryness must be perfect, there must be no crumbling, and every loaf must swell out completely to the standard size within ten minutes' immersion in water at 50° C. (122° F.). The competition seems to have failed to produce a specimen superior to Perrier's compressed bread, and the latter has been now definitely adopted in the French service. The issue of biscuit to the troops ceased on the 1st of January, 1895.

For the Subsistence Department of the United States kiln-dried hard bread in square cakes, put up in thoroughly seasoned wooden boxes holding 50 pounds net, has been usually purchased. Experience in the German Army has shown that the large-sized pieces of hard bread were unsatisfactory to the troops.

The military attaché at Berlin has reported as follows:

"Relative to hard bread, Mr. Englehardt, Chief of Division of the Commissary Department, informed me that during the war with France the soldiers threw away many hundreds of boxes of it because, in his opinion, the biscuits were too large and they had difficulty in biting them."

Recent experiments have been made among the troops in the various military departments of the United States with the result that hard bread made from the best quality of soft winter-wheat flour in cakes 1½ inches square, and packed in cartons of 1 pound each, has been found to give satisfaction.

The board that was convened to consider an emergency ration for the United States Army has reported, in its conclusions, that—

"It examined certain samples of hard bread submitted to it, and concluded that the best sample was that which became soonest permeated when soaked in hot water. The sample which gave the best response to this test was one which was slightly aerated, its substance being evenly pervaded with minute or pin-point vacuolations. Its density was somewhat lessened by this porosity, so that, pound for pound, it would occupy somewhat more space than ordinary hard bread; but the board considered that this could be offset in great part by exposing the aerated hard bread to a higher degree of heat

than is used in the baking of the ordinary bread; by this treatment weight would be lessened by getting rid of a small percentage of water, the percentage of the nutritive elements being thereby increased, while some of the starch would be converted into dextrine. The ready permeability of this biscuit would reduce to a minimum the number of cases of diarrhea that in field service so frequently originate in imperfectly softened and masticated hard bread. It was the unanimous opinion of the board that bread thus permeable and browned on the surface would be improved in its keeping and nutritious qualities, and be more acceptable to the men than the present issue."

HOMINY.

Hominy is made from hard, white Indian corn. It is classed as coarse, flake, pearl, and fine. Fine hominy is commonly called "grits" or "samp."

TO MAKE COARSE HOMINY.—The corn is kiln-dried and cleaned. It is then coarsely ground by the millstone process. The product is then run through a degerminator, which takes out the germs of the grains, and, also, all soft spots that may be on them. The product yielded by the degerminator is coarse hominy.

TO MAKE FLAKE HOMINY.—Coarse hominy is made and run into a steamer and steamed until it is soft. It is then run through a pair of rollers and rolled out flat, *i. e.*, into flakes and dried.

TO MAKE PEARL HOMINY AND FINE HOMINY.—These are both made at the same time by one process. The corn is coarsely broken by the roller process, and the product run to purifiers and bolts. The finer portion, or grits, passes through the meshes of the bolt and is spouted to a bin, while the coarser portion, or pearl hominy, tails over at the end of the bolt and is spouted to another bin.

Hominy is put up in barrels, each containing 200 pounds, net; in sacks, each containing 100 pounds, net; and in 2-pound cartons, thirty-six to the case.

Hominy should be stored in a cool, dry place. It is likely to become weevilly in summer, and musty in moist, warm weather.

JAM, BLACKBERRY.

Blackberry jam is crushed or disintegrated blackberries preserved with sugar.

The blackberry is the fruit of a species of bramble (*Rubus villosus*), a rather shrubby, herbaceous, perennial plant, with angular stems, mostly erect, having stout, curved prickles. It grows abundantly in all parts of the United States, along the borders of the fields and in the woods.

The blackberry, notwithstanding its name, is not a true berry, but an aggregated fruit, being a collection of small drupes or stone fruits on a fleshy receptacle. It is of large size, and, when ripe, of black or dark-purple color and sweet taste.

The making and canning of blackberry jam, although a simple process, requires care and good judgment. The season for making it is from July 1 to August 31. The blackberries are picked over; cleared of leaves and unsound, unripe, and other defective berries; washed to remove dirt, ants, and other small insects; and dried on galvanized-wire nets. They are then put into a steam-jacketed kettle, with a small proportion of water and the proper proportion of white, granulated cane sugar (about 35 pounds of sugar to 40 pounds of blackberries), and the mixture cooked to the proper consistency, being stirred continually to disintegrate the blackberries and prevent the product from scorching.

The product, now become blackberry jam, is put into the cans while hot, and the cans are immediately soldered up. This completes the canning, as no processing, puncturing, or reprocessing is required.

For Army use, blackberry jam is put up in 2-pound cans, twenty-four to the case; or in 1-pound jars, twenty-four to the case.

The quality of blackberry jam can be determined by its taste and appearance. When of good quality, blackberry jam is homogeneous in texture, and has a full, rich, pleasant flavor, quite peculiar to itself; and by these characteristics it can be readily distinguished from the inferior grades, which are generally made from inferior fresh stock, or from dried or canned stock.

It is sometimes adulterated with apples and artificially colored. If apple is present in blackberry jam, it can sometimes be detected by spreading a little of the jam on a piece of glass, when the apple may reveal itself by its stringy fiber.

JELLY, CURRANT.

Currant jelly is the juice of the currant concentrated to a semi-solid consistency and sweetened with sugar to the degree required to sufficiently neutralize its acidity.

The word "currant" is a corruption of the word *corinth.* The name "corinth" was first applied to a small dried grape or raisin subsequently, and now, called the Zante *currant,* which was introduced into England from Corinth, Greece; and the name "currant" came to be applied to the fruit of the shrubs of the genus *Ribes,* because of its resemblance to the so-called Zante currant.

The currant is one of the few small fruits that can be used for making jelly, and the red currant is the best variety for the purpose.

The season for making currant jelly is the month of June.

To Make Currant Jelly.—The currants are subjected to a sufficient pressure with a hydraulic press to extract the juice. The juice is then put into a steam-jacketed copper kettle, with the proper proportion of granulated white cane sugar, and concentrated, by boiling, to the exact consistency required to sustain its own weight when cool; and the mixture, now become the currant jelly of commerce, is, while hot, filled into cans, which are immediately soldered up.

Good currant jelly is of a clear, bright, crimson color, and has a decided flavor of currant. It is elastic, and, when cut with a spoon, should not adhere to it.

It is adulterated to a very large extent. The principal adulterants are apple jelly, gelatin, glucose, and artificial coloring matter. Sometimes the sugar is deficient in quantity or quality, or both.

For Army use, red-currant jelly only, put up in 2-pound cans, twenty-four to a case, or 1-pound jars, twenty-four to a case, is purchased.

LARD.

Lard is the oily part of the fat of slaughtered hogs separated from the tissue by heat. The process of separating the oily part of the fat from the tissue is called "rendering."

Lard is classified according to the kinds of fat from which it is rendered, as follows, viz:

Pure leaf lard, choice lard, and pure lard.

Pure leaf lard is made from the leaf fat only; choice lard from leaf fat and ham trimmings, in the proportion of about 85 per cent of leaf fat and 15 per cent of ham trimmings; and pure lard from leaf fat, ham trimmings, and back fat, in the proportion of 50 per cent of leaf fat and 50 per cent of ham trimmings and back fat; or, from leaf fat, ham trimmings, back fat, and gut fat, in the proportion of 50 per cent of leaf fat and 50 per cent of ham trimmings, back fat, and gut fat.

Lard is further classified according to kinds of fat from which it is rendered, or the modes of rendering it, as neutral lard, choice kettle-rendered lard, and prime steam lard.

Neutral lard is made from fresh leaf fat. It is either chilled in a cold atmosphere or treated with cold water, to remove the animal heat. It is then reduced to a pulp, in a grinder, and passed at once to the rendering kettle. The fat is rendered at a temperature of from 105° to 120° F. Only a part of the lard is capable of being rendered at this temperature. The separated lard is washed, in the melted state, with water containing a trace of sodium carbonate, sodium chloride, or a dilute acid. The lard thus formed is almost neutral, containing not to exceed 25 per cent of free acid; but it may contain a considerable quantity of water and some salt.

Neutral lard is used almost exclusively for making an imitation of butter, oleomargarine, which is sold under the name of "butterine." The residuum of the neutral-lard process is subjected to steam heat under pressure, and the fat thus obtained is an inferior quality of leaf lard.

The residuum of the neutral-lard process and the back fat mixed in proper proportions are rendered in steam-jacketed kettles, and the product is called choice kettle-rendered lard. The hide is removed from the back fat, and both the leaf and

back fats are run through a pulping machine before they are put into the rendering kettle.

The South Omaha process or mode of making kettle-rendered lard is as follows, viz:

Forty per cent of leaf fat and the balance in fat trimmings are put into a hasher and cut fine. The fats thus prepared are then put into a steam-jacketed kettle and boiled for a sufficient time, under a steam pressure of 35 pounds to the square inch; then run through a fine cloth strainer, which retains all the scraps, and the liquid portion, or lard, which passes through the strainer, is filled into cans, or pails, as may be required to meet the demands of the market.

Choice lard is defined in the regulations of the Chicago Board of Trade as follows, viz:

"CHOICE LARD.—Choice lard is made from leaf fat and fat trimmings only, either steam or kettle rendered, the manner of rendering to be branded on each tierce."

Prime steam lard is made of the head of the hog, after removing the jowl, the fat of the small intestines, and any fat that may be attached to the heart of the animal. In houses where kettle-rendered lard is not made, the back fat and fat trimmings are also used. When there is no demand for leaf lard, the leaf fat is also put into the rendering tank. Prime steam lard, therefore, may sometimes contain all of the fats of the whole animal, and sometimes only portions thereof. The quantity of fat yielded by each animal varies with the mode of cutting and trimming the meat. A hog cut and trimmed for the domestic market will yield an average of about 40 pounds, while the yield of one cut and trimmed for the English market is only about 20 pounds.

Prime steam lard is thus defined by the regulations of the Chicago Board of Trade:

"Standard prime steam lard shall be solely the product of the trimmings and other fat parts of hogs, rendered in tanks by the direct application of steam, without subsequent change in grain or character by the use of agitators or other machinery, except as such change may unavoidably come from transportation. It shall have the proper color, flavor,

and soundness for keeping, and no material which has been salted shall be included. The name and location of the packer and the grade of the lard shall be plainly branded on each package at the time of packing."

At large packing houses, the building for the extraction of lard adjoins the main building, and is of the same height, viz, three stories. In the second story are arranged several rendering tanks made of heavy boiler iron, 12 feet high and 6 feet in diameter, capable of sustaining a high pressure. The tanks extend upward, through the floor above, into the third story, where each one is provided with a large manhole. The leaf fat, gut fat, and fat trimmings, in the proportions necessary for making the kind of lard desired, are put into the tank, when it is closed, and steam at a pressure of 15 pounds to the square inch is turned, on and the rendering process continued until every particle of lard is set free. One of the rendering tanks is used for making steam leaf lard, or choice lard, another is reserved for making "white grease," in which the intestines, etc., and the refuse from the slaughterhouse are placed and subjected to the same process. Another rendering tank is used for trying out the carcasses of hogs which have been killed by accident while in the pens. They are dumped into the tank whole, and the product is known as "yellow grease." After the mass in a rendering tank has been steamed for a proper length of time, a faucet is opened about the middle of the tank, where the lard and water meet, and the lard is drawn off in a very large open iron tank called a "clarifier," which has a steam-jacketed, concave bottom; here the lard is heated to 300° F. which sends all light, foul matter to the top as a thick scum, where it is skimmed off, all heavy matter settling to the bottom; a faucet is then opened at the bottom and the sediment withdrawn. The clarified lard is then run into coolers and thence into barrels, which are weighed and branded. After the lard has been drawn from a tank, the large manhole at the bottom is opened, and the whole greasy residuum is drawn out into large wooden tanks set even with the floor. This residuum is again subjected to boiling heat, and all the remaining lard is set

free and rises to the top. The water is then drawn off, leaving a solid residuum, which is used as a fertilizer. In this residuum will be found bones and even teeth, so soft as to be readily crushed by the fingers. The bristles and the hair are saved and sold, and but little of the hog is wasted.

The open kettles hold from 2,500 to 5,000 pounds, and the rendering tanks from 18,000 to 35,000 pounds.

Changes of temperature have a damaging effect upon lard. Lard that keeps well in a uniform temperature will eventually become rancid if exposed to a varying temperature Lard put up at a temperature of, say, 50° F., melts and deteriorates if exposed to a temperature of 80° or 90° F., as may happen during transportation. The best packers stiffen their lard intended for shipment to a warm climate with beef stearin or heavier fats, which do not melt at so low a temperature as pure lard,

The mark, "Guaranteed as pure lard," frequently seen on packages, is not a guarantee of the keeping qualities of the lard, but only that it is made exclusively from the fat of hogs. Numbers of such packages are opened in the South, after exposure to the heat there, and found to be rancid.

PROPERTIES OF PURE LARD.—The specific gravity of pure lard varies rapidly with the temperature. It is not easy to take the specific gravity of lard at a lower temperature than from 95° to 104° F., inasmuch as below these temperatures solidification is apt to begin. The specific gravity, therefore, is usually taken at from 95° to 104° F., or at the temperature of boiling water, viz, 212° F. At 95° F. the specific gravity of lard is about 0.890; and at 212° F., about 0.860, referred to water at 95° F. The specific gravity of pure lard does not differ greatly from many of the substances used in adulterating it, but it is distinctly lower than that of cotton-seed oil, and this is of great value in analysis.

The melting point of lard is a physical characteristic of great value. The melting point of the fat of the hog depends upon the part of the body from which it is taken. The fat from the foot has the lowest melting point and the fat of the intestines the highest—the first being 95.18° F. and the last

111.20° F. The melting point of the fat of the head is 95.9° F., while the kidney fat has a melting point of 108.5° F. In general, it may be said that the melting point of steam lard is about 98.6° F., which is the mean of ten samples examined.

While the melting point can not be taken as a certain indication of the purity of lard, nevertheless a wide variation from 104° F. in the melting point should lead to a suspicion of its genuineness, or indicate that it was made from some special part of the animal.

Properties of Adulterated Lard.—To a nonexpert, adulterated lard is not appreciably different in appearance from pure lard. An expert is, however, generally able to distinguish an adulterated lard from a pure one by the taste, odor, touch, and grain. There is usually enough lard in the adulterated article to give it the taste and odor of genuine lard.

In the present state of knowledge, the chemist is unable to determine absolutely the degree of adulteration of a sample of lard. He can, however, state with confidence whether or not a given sample is adulterated, and in the comparison of two widely different samples, he may safely assert that one is adulterated to a greater degree than the other. Further than this, which for practical purposes is far enough, the present state of knowledge will not permit him to go.

As a general observation, it may be stated that the steam lards of commerce have a more constant composition than pure lards made in other ways from special fats.

Steam lards have a peculiar, strong odor, which distinguishes them from choice kettle-rendered lards.

In this country the most common adulterants of lard are tallow, cotton-seed oil, and water.

All kinds of lard contain from 1 to 7 per cent of water.

To determine the quantity of water in a sample of lard, a weighed portion of the sample is subjected to a boiling heat until bubbles of steam cease to escape therefrom, and then weighed; the loss in weight thus ascertained is the weight of the water.

Stearins.—The stearins are the more solid portions of the animal and vegetable fats remaining after the more fluid

portions have been removed by pressure. The stearins used in the manufacture of lard compound are lard stearin, derived from lard, and oleo stearin, derived from beef tallow. Cotton-seed-oil stearin is used chiefly in the manufacture of butterine.

Lard Stearin.—Lard stearin is used in making lard compound. It is made as follows: Prime steam lard, if properly crystallized and of the right temperature (from 45° to 55° F., in winter, and from 55° to 65 F., in summer), is sent at once to the press; if not properly grained, it is melted in a crystallizing room, at from 50° to 60° F., until the proper grain is formed. The lard, in the form of cakes, is then wrapped in cloth, each cake containing from 10 to 20 pounds. The cakes are then placed in a large press, with suitable septa to facilitate the egress of the oil. These presses are sometimes from 40 to 50 feet in length and, when first filled, from 12 to 18 feet high. The pressure is applied very gradually. The lard expressed is the well-known lard oil of commerce, which is used for illuminating and lubricating purposes; and the residuum is lard stearin, and is used in making lard compound. It has about 5 per cent of free fatty acid (less than lard oil) and crystallizes in long needles, which give it a tough texture.

Oleo Stearin.—This product is made chiefly from the caul fat of the ox. This fat is rendered in open kettles, at a low temperature. The resulting tallow is placed in cars in a granulating room, where it is allowed to remain for from thirty-six to forty-eight hours, at a temperature of from 80° to 90° F. The contents of the cars are then mixed and placed on a revolving table, where they are made into cakes; these are wrapped in strong cotton cloth and placed at the temperature of 90° F., in a powerful press, where a gradual pressure, becoming very strong at the end, is applied for one or two hours. The expressed oil, known as oleo oil, is used in the manufacture of butterine. The stearin is removed from the press as hard, white cakes, and is used in adulterating lard. The oil is sometimes filtered with a small percentage of fuller's earth to improve its color and brightness.

In regard to receptacles for lard, wooden tubs are preferable to tin cans. It keeps sweet in the former, but becomes rancid

in the latter. It is stated upon good authority that lard put up in wooden receptacles has been known to keep sweet for three years. The chief objection to wooden receptacles is their great liability to leak.

Lard should be kept in cold storage, where it will keep indefinitely. If subjected to heat sufficient to melt it, while in storage, it will become rancid; and it should be remembered that this is one of the marked characteristics of pure lard.

For the trade, lard is put up in tierces, iron-bound barrels or kegs, 3-pound and 5-pound tin cans, and 3-pound and 5-pound tin pails. The tin cans or pails are packed in wooden cases of twelve cans or pails each.

COTTOLENE.—This is a compound made of cotton-seed oil and beef suet. It was largely advertised at the World's Fair, at Chicago, in 1893, and has taken quite a hold upon the public as a substitute for lard.

MACARONI.

The constituents of macaroni are flour and water only.

Very strong flour, *i. e.*, flour containing a large percentage of gluten, is essential to the making of good macaroni.

TO MAKE MACARONI.—Flour and water, in proper proportions, are placed in the kneading trough of a mechanical mixer and kneaded into a very stiff dough. The kneading process takes about forty-five minutes. The dough is then put into a cylinder about 15 inches in diameter and 20 inches long, at the bottom of which there is a steel plate or die, about an inch in thickness, perforated with holes of the diameter of the macaroni to be made. In each of these holes is a mandrel, which forms the well-known hollow of the macaroni. This cylinder is provided with a follower or piston operated by hydraulic pressure. The lower part of the cylinder is incased in a steam jacket, filled with live steam, to keep the dough warm and elastic without adding moisture. Hydraulic pressure of about 1,000 pounds to the square inch is applied to the follower, and the dough is thereby forced through the holes in the die, emerging therefrom in the form of tubes, which are cut into pieces of the proper length. These are placed in trays

and very slowly dried, the process requiring about eight days. The dried tubes are macaroni, and are ready for packing. Thorough and slow drying is essential.

One hundred pounds of flour will make 92 pounds of macaroni, *i. e.*, from 2 to 6 per cent of the water in the flour, together with that added in the making, must be eliminated before the macaroni is properly dried.

Good macaroni, when boiling water is poured on it and boiled for forty-five minutes, should swell, turn white, and become tender.

Macaroni is very liable to become infested with weevils, which can be detected by opening the end of a package, holding it vertically, and striking it smartly several times upon a sheet of white paper. The weevils, if present, will fall upon the paper.

It is packed in bulk in 25-pound boxes, and also in 1-pound packages, twenty-four or twenty-five to the box.

Macaroni should be stored in a cool, dry place.

MACKEREL.

The mackerel is a well-known food fish of the genus *Scomber*. The most important species are *Scomber vernalis*, of the North American Atlantic waters, and the *Scomber vulgaris*, of the European seas. It is a migratory fish, and its migrations are said to be as extensive as those of the herring. It is a very voracious fish, feeding principally upon the fry of other fishes. It is a rapid grower, and attains an average of 15 inches in length and 10 pounds in weight. The fish rapidly become soft after being taken from the water, and if they are to be used fresh they must be eaten promptly. The natural flavor of the mackerel is well retained in the salted state.

Mackerel of the different species are found in all the northern seas, in the Mediterranean Sea, the Black Sea, and the Sea of Azof; and in the waters of Australia, the East Indies, and the Cape of Good Hope. The common mackerel of our northeastern coast is found in all the North Atlantic waters.

Mackerel fishing is extensively carried on in Massachusetts, Gloucester being the principal center of the industry in this

country. The fishing season is from June to November, inclusive. The fishing is carried on in vessels ranging in size from 45 to 90 tons, and carrying a crew of about fifteen men. The seine, which is now mostly used for taking the fish, did not come into general use until 1873. It weighs about 2,000 pounds, and is about 1,000 feet long, 150 feet wide (or deep) in the middle, and narrower at the ends. The seine is carried by a large boat, which has two small boats as tenders. When a shoal of mackerel is "sighted," the boats tow the seine so as to head off the shoal, and then one end is carried around so as to inclose the fish in the circle formed by the seine. The vessel is then brought alongside and the fish taken from the seine by dip nets. Sometimes the fish escape by diving under the seine. About two hours are required to make a cast of the seine, and sometimes fish enough to make 250 or 300 barrels of salt mackerel are taken at a single cast.

In the Gulf of St. Lawrence the mackerel are taken by hook and line, their habits there being unfavorable for seining.

The process of dressing mackerel consists of four operations, viz, splitting, gipping, plowing, and washing. The splitter splits them at the rate of 1,500 per hour. He passes the knife along the back of the fish from the head to the tail, leaving the backbone on the right side, and throws them into a tub. Two gippers stand at each tub, remove the gills and entrails, and throw the fish into a barrel, called the wash barrel, where they are allowed to soak. The fish are afterwards taken out singly, laid on a board skin-side downward, and a light stroke of the plow (a knife of peculiar shape) is given on each side, from the head toward the tail, two-thirds the length of the fish. This operation is sometimes postponed until the fish are landed.

Salting is done by laying the fish singly in the barrel and sprinkling a small handful of salt on each. In this condition they are allowed to remain overnight, when some of the pickle is drawn off, and the barrels are filled to the proper weight, headed up, and stored in the hold of the vessel. A little less than a bushel of salt is used in making a barrel of salt mackerel, and it takes five wash barrels of fish to make a barrel of salted fish. After being landed, the fish are assorted,

inspected, and branded by an official inspector appointed by the State.

Mackerel are graded according to quality, as "Bloaters," "Selects," and "Extras;" and according to size, as "No. 1," "No. 2," and "No. 3."

No. 1's should measure not less than 13 inches long from the tip of the nose to the crotch of the tail; No. 2's should not be less than 11½ inches long; and all smaller than No. 2's are No. 3's.

These lengths determine quite accurately the age of the fish. The terms "Bloaters," "Selects," and "Extras," refer to the quality or condition of the fish—not to its size. The fatter the fish the better the quality. The meat should be tender, firm, and of a clear color; the inside of the belly sufficiently tender to break on slight pressure. The "messing" of mackerel consists in removing the heads and tails.

Mackerel are designated in the market by the following terms, according to the locality where caught, as "Norways," caught on the coast of Norway, and "Shores," which are caught near the shore and are generally not so fat as "Norways." Those caught off Prince Edwards Island are called "Islands," the meat of which is of a dark, reddish color, and tough. Those caught in the Bay of St. Lawrence are called "Bays," the meat of which is still darker than that of the "Islands."

The commercial packages of mackerel are barrels of 200 pounds, half barrels of 100 pounds, and kits of 20, 15, and 10 pounds, respectively.

"Extra No. 1 Mess," and "No. 2 Mess," "Norways," or "Shores," put up in 10 or 15 pound kits, are the best for Army use.

Mackerel should be stored in a cool, damp place (the basement of a building is the most suitable place), and kept well brined, as they soon become discolored, "rusty," and impaired in quality if the brine leaks out and leaves them dry.

Mackerel should not be exposed to the sun for any length of time, and, if it is transported by railroad in hot weather, it should be carried in a refrigerator car, if practicable; or, if by vessel, it should be stored in the hold.

MATCHES.

Matches were invented in 1650, soon after the discovery of phosphorus.

The earliest form of match was a splint of wood with one end dipped in melted sulphur, to render it easily inflammable, which was ignited by the flame produced by rubbing phosphorus between the folds of rough paper. Another form, known as the "chemical match," was a splint of wood with one end tipped with a composition of potassium chlorate, sulphur, gum, and sugar, which was ignited by dipping it in a solution of sulphuric acid kept in a vial. It was not until 1829 that the lucifer match was invented. Its use spread rapidly and its manufacture soon became an important industry.

Matches are manufactured at all seasons of the year, though the winter months are considered the most favorable. The wood used for match splints is the best quality of white pine, and in this country is obtained mostly from Michigan. It is fashioned or cut into proper lengths and sizes by machinery for the purpose. The splints are dipped in paraffin half their length, and, afterwards, the same ends are tipped with a composition composed, generally, of amorphous phosphorus, niter, whiting, coloring matter, and glue. The paraffin serves as the kindling, to conduct the flame to and ignite the wood, and the whiting and glue to give the composition the necessary solidity and adhesiveness. Should the head of a match break off when an attempt is made to light it, it indicates that the glue used in making the composition was not of good quality. The best Irish glue should be used. Sulphur matches burn slowly, because sulphur is used as the kindling material instead of paraffin.

Red or amorphous phosphorus is now generally used instead of common phosphorus. In safety matches, the phosphorus is placed on the side of the box, and the other materials on the splint, which can only be ignited by being brought in contact with the red-phosphorus composition on the side of the box.

A good match, when thoroughly lighted and then extinguished, should leave no live coal. The safety match with the

paraffin conductor, is the only kind of match furnished for Army use.

The theory of the safety match is to separate the potassium chlorate and the phosphorus, which are united in the head of the ordinary match. The composition for the safety match is made of potassium chlorate or nitrate, antimony, sulphur, and glue. This match will not light unless rubbed against a surface containing phosphorus. Some manufacturers put a small quantity of phosphorus into the composition of the head of their safety matches. A match made with such a composition is not a safety match.

For the trade, matches are packed in paper boxes, and these in wooden cases of 5 gross each, which are, also, suitable packages for Army use.

Matches should be stored in a dry place, either on the first floor or in the upper stories, but never in the basement or any room under ground, as they are very susceptible to injury by dampness. The same care as to dryness while they are in store is requisite while they are in transportation.

MILK, CANNED.

Canned milk is commonly known as "condensed milk." Condensed milk is a term applied to a preparation of preserved milk. The process of condensing and preserving milk is as follows: As soon as the milk is received at the factory, it is passed through the strainer into the receiving vat; from there it is conducted through another strainer into the heating cans, each containing about 20 gallons. These cans are then set in hot water, and kept there until the milk in them attains a temperature of from 150° to 175°F. It is then passed through another strainer into a large vat, at the bottom of which is a coil of copper pipe through which steam circulates, and the milk is thereby heated to 212°F. The best quality of granulated cane sugar is then added, in the proportion of 1¼ pounds to a gallon of milk. The milk is then drawn off into a vacuum pan, having a capacity of 3,000 quarts. It is kept in the vacuum pan, and subjected to the heat of a steam coil for about three hours, during which time about 75 per cent of its water is removed by evaporation. It is then drawn off

into cans having a capacity of about 40 quarts each, which are placed in cold water and the milk allowed to cool to a little below 70°F. It is then poured into large drawing cans, furnished with faucets, from which it is drawn into the small commercial cans, which are taken to the soldering table and immediately soldered up.

Milk prepared as above described can be kept without deterioration for a long time, and can be used for all the purposes of ordinary milk.

Condensed milk is also prepared by a process similar to the one above described, except that no sugar is used.

It is put up in 1-pound cans, forty-eight to the case.

MOLASSES.

Molasses is the brown, viscid, uncrystallizable sirup which drains from sugar in the process of manufacture. It contains water, uncrystallizable sugar, coloring matter, and more or less crystallizable sugar. It differs from, and is inferior in quality to, treacle, sometimes called "sugarhouse molasses," the sirup which drains from sugar in the process of refining.

As there is always more or less crystallizable sugar left in molasses, and as the quality of molasses varies directly with the proportion of crystallizable sugar held in solution, there is great diversity in the quality of molasses.

Molasses, especially the poorer grades, is often adulterated in different ways, for the purpose of improving its appearance and taste. The principal adulterant is glucose, and the principal manipulation, "bleaching," by means of chemicals.

Molasses comes into market about November. It is very subject to fermentation, and, therefore, should not be transported in warm weather. When it ferments it expands very considerably, and it is, therefore, necessary that receptacles containing it should have a very considerable "outage" (not less than 20 per cent), to prevent them from bursting, in case fermentation sets in.

General Remarks.—Molasses and sirup are liable to ferment or sour when exposed to heat; it is therefore advisable to keep them in cool cellars, and, if in retailer's hands, in as

cool and dark a place as their storerooms afford. They may begin to ferment during moving or transportation; and, when received at a post, should be placed in a cellar, the bungs taken out of the barrels, and allowed to remain quiet for a few days, when the fermentation will cease without injurious effects. When sorghum molasses begins to ferment, the fermentation can be stopped by opening the bung and placing a small piece of butter in the barrel.

Molasses is put up by the manufacturers for the trade in large barrels. For Army use, it should be put up in barrels, or 10-gallon kegs, with outage, as above specified.

MUSHROOMS.

Mushrooms are one of a large class of cryptogamic plants known as the *Fungi.*

They are cellular plants having, generally, a more or less rounded thallus or head supported upon a stalk, with spores or seeds upon the under surface or gills. They are very numerous, being found in all parts of the world, and are usually of very rapid growth, often springing up and coming to maturity in a single day. Many species are used for food, while others are very poisonous.

Mushrooms are largely cultivated in old quarries, in the vicinity of Marseilles and Paris, France, whence come most of the canned mushrooms used in this country.

The principal requisites for growing mushrooms are a rich soil, moisture, and absence of light. The absence of light gives them their characteristic straw color.

They are gathered daily and canned while fresh, as they wilt and become tough very speedily. After the mushrooms are put into cans, sufficient water is added to fill the interstices. Sometimes a little salt is put into the water.

The best grade of canned mushrooms contains only "buttons" or small mushrooms, and these should be unbroken, free from dark spots, and of a uniform color. The cans should be well filled with mushrooms. The poorer grades often contain more stems than heads and more liquor than substance.

They are put up in 1-pound cans, one hundred to the case. and should be stored in a cool, dry place.

MUSTARD.

There are several varieties of mustard seed known to commerce, among them the "Dutch," "Bombay," "English," "Trieste," "California," and "Kentucky." As to color, it is sometimes designated as black or white, but generally as brown or yellow. Manufactured mustard is known as colored and uncolored.

The blend of English and Trieste mustards has a high reputation, but the cultivated California mustard compares favorably with it.

California produces more mustard seed than any other State, not only supplying the Eastern States, but shipping a considerable quantity to Europe as well. The crop of 1893 was about 10,000,000 pounds.

The crop is harvested in August and September. The seed is "seasoned" before it is ground, *i. e.*, it is kept on hand six months or a year. It is then carefully cleaned, freed from chaff, dust, and dirt, and crushed between powerful iron rollers; the crushed product is placed in strong woolen bags and subjected to a pressure of 6,000 pounds to the square inch in a hydraulic press. The cakes are then piled up in a well-ventilated room, so as to let the air circulate around them, and, after one or two months, they are pounded or broken up fine and bolted. The mustard thus prepared is ready for canning.

Mustard is generally colored with turmeric to make it more sightly; and, when not in excess, it does not affect the taste, and is not considered an adulterant.

The brown seed has the best flavor and the greatest pungency, and the yellow yields the best oil and the most flour, but is weaker in flavor and strength. A mixture of equal parts of the brown and yellow California mustard seeds, if properly manufactured, is as good as the imported article.

The principal adulterants of ground mustard are wheat flour, starch, corn meal, and linseed meal; the first three can be detected by iodine, the other by the microscope. A comparative test for strength can be made by making an infusion

of about 15 or 20 grains of a sample of mustard in 4 or 5 ounces of boiling water, and an infusion of a similar quantity of the standard sample, and tasting them.

It is packed for the trade in ¼-pound, ½-pound, and 1-pound tins, twenty-four, twenty-four, and twelve cans, respectively, to the case.

Mustard should be stored in a cool, dry place, and will keep well for a year or more, but it does not improve with age.

MUSTARD, FRENCH.

French mustard is a compound of ground mustard seed (a mixture of brown and yellow, more of the yellow being used, as it produces more flour and is less pungent than the brown); burnt flour or starch as a filler, and vinegar and ground spices, such as cloves, allspice, malegueta pepper, etc. The flavor of onions is, also, sometimes added to the compound.

Different manufacturers have different formulas for making French mustard. Like all compounds, its quality depends upon the quality and proportions of the ingredients.

TO MAKE FRENCH MUSTARD.—The mustard seed is usually soaked in vinegar overnight, then ground, when the spices, or flavoring, and the filler are added; the mixture is then reground several times, until it has a smooth, jelly-like texture, when, after it is cooled, it is ready for bottling.

The vinegar and mustard seed are sometimes mixed in the grinding, and are sometimes allowed to stand for three or four weeks to ferment. It is questionable whether this should be done. If properly made, it improves after being bottled, and a separation of the ingredients or a trace of fermentation indicates poor manufacture or excessive adulteration. The adulterants are starch, roasted flour, coloring matter, and often rape seed.

French mustard should have an agreeable taste, be smooth and uniform in texture, and keep for a period of not less than two weeks, after being opened, without any deterioration except drying at the top.

It is put up in wide-mouthed glass bottles of various sizes, usually ½-pound and 1-pound. These are stopped with corks

and sealed with wax, and packed twenty-four and twelve bottles to the case, respectively.

It should be stored in a cool, dry place.

NEEDLES.

Needles are put up, according to size, in papers containing twenty-five needles each. "Sharps" and "betweens" are put up in separate papers. For Army use, needles should be called for in subpackages, each containing seven papers, each paper containing one of the size from No. 2 to No. 9, inclusive, sharps and betweens, assorted.

Darning needles are put up in papers containing twenty-five needles each.

For Army use, the following sizes should be called for, viz, Nos. 14, 16, and 18.

Needlebooks are made of morocco. Each book contains one paper of needles of size No. 6; one of size No. 7; one of size No. 8; one of size No. 9; one of size Nos. 5 to 9, assorted; seven darning needles, and one bodkin.

All needles are put up in patent wrappers to prevent, by absorption, any moisture from accumulating on them and causing rust.

The needlebook is well adapted for use of soldiers.

The quality of needles is determined by their temper and finish. The finish of the eye is particularly important, as any imperfection thereof would cause the thread to break.

Needles should be stored in a dry place, as they are very liable to rust if exposed to moisture.

NUTMEGS.

The nutmeg is the kernel of the fruit of a small tree of the genus *Myristica*, which is indigenous to the Molucca Islands, but is cultivated in many parts of the East Indies.

The tree attains a height of about 30 feet, and has a straight stem and a branching head. Its flowers are male and female, small, and of a yellow color, and the opposite sexes grow on different trees. The fruit is a nearly spherical drupe, of the size of the pear, of a yellowish color without and almost white

within. After the ripening of the drupe, its external covering or husk becomes dry, and opens into two nearly equal longitudinal valves, disclosing the inner covering or arillus, which is of a beautiful blood-red color, and, when cured, is commercially known as "mace." Beneath the arillus is a brown, shining shell containing the kernel or *nutmeg.*

There are two species of nutmeg trees—the royal, which produces the long nuts that have the arillus much larger than the nut, and the queen, which produces the more valuable round nuts that have the arillus extending only halfway down the nut.

Nutmeg trees are raised from the seed and do not flower until they are eight or nine years old. When they are two years old the male trees are all headed down and grafted with scions taken from the female trees, reserving only sufficient male stock for fecundation.

The natives of the East gather the fruit by hand, taking off and rejecting the outer shell or husk. The arillus is then carefully taken off and exposed to the sun's rays for one day, which changes its beautiful blood-red color to a light brown; it is then removed from the direct rays of the sun and allowed to remain eight days more, when it is moistened with sea water to prevent its drying too much or losing its oil, and it is then put into bags and firmly pressed, when it becomes the mace of commerce. The nuts, which are still covered with their woody shell, are exposed to the sun's rays for three days, and afterwards dried before a fire until they will rattle when shaken; they are then beaten with small sticks, in order to remove the shells, which, under the operation, break into pieces and fly off. The nuts are then assorted into three lots; the first, composed of the largest and most perfect nuts, is for exportation; the second is for the domestic trade; and the third, composed of the unripe and damaged nuts, is burnt.

The nutmegs, after having been thus selected, are pickled in limewater of a semifluid consistency, made with lime obtained by calcining marine shells. Into this mixture the nutmegs, contained in small baskets, are plunged two or three times, or until they are completely covered with the lime.

They are then laid in heaps and allowed to sweat, after which they are packed in barrels or bales for market.

The best nutmegs come from Penang. They are about 1 inch long, shaped like a damson plum, pale brown, furrowed on the exterior and gray inside, with veins of red running through them.

Nutmegs are worthless when their oil is dried out of them. To determine whether a nutmeg has lost its oil wholly or partly, pierce it with the point of a knife or other sharp instrument; the oil, if present, will appear in the puncture in greater or less quantity, proportionately to the amount contained in the nut. Another method is to cut the nut into halves, and if the oil is dried out, it will crumble in the cutting.

Nutmegs are graded according to their number to the pound. For Army use, extra-limed nutmegs, running from 65 to 70 to the pound, should be purchased. Nutmegs running less than this number to the pound are deficient in oil.

OATMEAL.

Oatmeal is the ground seeds of the oat plant (*Avena sativa*), and belongs to the order *Gramineæ* or grass family of plants. The seeds of the oat plant, commonly called "oats," are, by reason of their chemical composition, peculiarly well adapted for use as food for man—the proportions of both flesh formers and heat givers being unusually large.

The oat seed has a hard and indigestible husk, which must be broken before the gastric juices of the stomach can act upon the kernel. It also has long, sharp spikes, which, if not removed, would accumulate in and irritate the intestines. It is, therefore, necessary to remove the entire husk, with the spikes, in the process of making oatmeal.

There are two kinds of oatmeal, viz, the "steel-cut," which is granulated, and the "rolled," which is flaked.

Great care should be exercised in selecting the oats for making oatmeal, as good oatmeal can be made only from the best quality of large white oats.

To Make Oatmeal.—The oats are first thoroughly cleaned—freed from dust, dirt, and foreign matter. From the cleaner

they go to the dry kiln; this is an important part of the manufacture, and varies in different mills. The great desideratum is to thoroughly dry the oats without steaming them in their own moisture; therefore, a low heat, at first about 220° F., and afterwards from 290° to 300° F., is maintained. Perfect ventilation is necessary, *i. e.*, free passage of hot air, in order that the moisture may be carried off. The drying process is continued for about two hours. They are then graded according to size, then taken to the hulling stones, and from there run through currents of air to remove the hulls, dust, and fuzz.

If it is desirable to make "steel-cut" oatmeal, the oats thus prepared are next ground, and the product is steel-cut oatmeal.

Or, if it is desirable to make "rolled" oatmeal, the oats, after leaving the hullers, are subjected to a jet of steam of about 60 pounds pressure (care being taken to have the steam as dry as possible), for the purpose of toughening them so that they will not pulverize, but flatten out into flakes, when subjected to the pressure of the rolls. After passing through the rolls, the crushed or flaked oats travel in a thin stream on a "draper" for some distance to remove the fine dust and any excess of moisture. The product, after cooling, is "rolled" oatmeal.

The rolled oatmeal will keep as well as, and perhaps better than, the steel-cut, because the steaming process cooks it a trifle more, and also removes the fusel oil, which, in a warm climate, is liable to become rancid.

Rolled oatmeal cooks more readily than steel-cut. To cook it properly, it should be mixed with boiling water and allowed to stand and simmer, without stirring, for about twenty minutes. Steel-cut oatmeal should be cooked gently for from one to two hours, and stirred frequently to prevent scorching.

Rolled oatmeal is about the only cereal food that can be used with satisfactory results without further cooking. When no fire is available, if mixed with cold water, with a little salt or sugar, and allowed to stand for one or two hours, it makes a palatable, wholesome, and nutritious food and drink combined. Rolled oatmeal is much better for this purpose than

steel-cut oatmeal, as it softens more readily and has less of the raw taste.

A pound of rolled oatmeal and from 2 to 4 ounces of sugar, with 3 quarts of water per man per day, will subsist marching troops for a week without injury to their health.

The chemical composition of oatmeal is, by weight, as follows, viz:

	Per cent.
Water	5.0
Fibrin, etc	16.1
Starch, etc	63.0
Fat	10.1
Cellulose and lignose	3.7
Mineral matter	2.1
Total	100.0

Steel-cut oatmeal is sometimes adulterated with wheat flour, barley flour, or corn meal.

Both kinds of oatmeal are packed in 2-pound cartons, some brands forty-eight and others seventy-two to the case, and in half barrels containing 100 pounds.

Oatmeal should be stored in a cool, dry place, not near articles that emit odors. It deteriorates with age, and, therefore, the supply thereof should be frequently renewed.

OIL, OLIVE.

Olive oil is one of the constituents of the olive, the fruit of the *Olea europæa* or olive plant, which, besides having the distinction of bearing the fruit that yields the finest food oil known to man, has also that of being the emblem of peace.

The olive plant is a shrub or small tree, sometimes attaining a height of 20 or 30 feet. It has an upright stem with numerous branches, opposite leaves, small white flowers, and a stone fruit or drupe. The drupe is of medium size and ovoidal shape, and has a skin of a greenish, whitish, or violet color. The oil is contained in the flesh surrounding the stone.

The olive tree is very long-lived, some specimens being considered 1,000 years old. It is supposed to have come originally from Asia. It grows well in Syria, and has been naturalized in the south of France, in Italy, Spain, the northern states of

Africa, Mexico, and California. It has been cultivated from the earliest times, and is frequently mentioned in the Bible.

There are many varieties of the olive tree. Pliny vaguely describes fifteen varieties as being cultivated in his day, while, at the present day, at least thirty varieties are cultivated in France and Italy alone. The cultivation of the olive tree was introduced into Mexico by the Jesuit missionaries. California, where it now thrives in a great variety of soils and locations, was then a part of Mexico.

The long-leaf variety is the one generally grown in France and Italy, and the broad-leaf variety in Spain. The long-leaf variety produces the finest oil, the oil of the broad-leaf variety being of a strong, rank flavor.

TO MAKE OLIVE OIL.—When the olives begin to ripen, their greenish color changes to a wine color, and they are then fit for making oil. They are gathered, carried to a mill and bruised, the millstones being set at such a distance from each other that they will not crush the stones of the olives. The pulp thus prepared is put into bags made of rushes, and these are put into a press and subjected to a moderate pressure; and thus is obtained, in considerable quantity, a greenish, semi-transparent oil of very superior quality, which is the finest olive oil, and, being from the first pressing, is called "virgin" oil. After the first pressing, the pulp is moistened with water and again pressed. The product of this pressing is an inferior quality of table oil. The pulp is then broken up, put into vats with water and allowed to remain there until it ferments, when it is again pressed. The oil yielded by the pulp at the third pressing is of very inferior quality, and is used for making soap and for other manufacturing purposes.

ADULTERATIONS.—Olive oil is extensively adulterated with cotton-seed oil, peanut oil, and other vegetable oils. It is, also, sometimes adulterated with lard.

There are various methods of determining the presence of adulterants in olive oil. The color reactions which result from treatment with acids and alkalies are important tests, and are fully discussed in various published works. Perhaps the simplest test is that by means of nitric acid, viz:

HOW TO DETECT ADULTERATED OLIVE OIL.—(From a paper read before the Liverpool Chemists' Association.) "Mix thoroughly one part of strong nitric acid (specific gravity 1.42) with nine parts of oil to be tested, and pour the mixture into a white porcelain dish capable of holding at least ten times the quantity. Apply heat gently until action between the acid and the oil is fairly set up, then remove the source of the heat and stir well with a glass rod until the action is over. Pure olive oil thus treated and allowed to cool sets into a pale straw-colored, hard mass in an hour or two, while cotton-seed and other seed oils assume a deep orange-red color, and do not set like olive oil. It will be seen that the delicacy of this test depends on the great contrast in color exhibited between genuine olive and seed oils, when operated on as described; so that an admixture of 5 per cent of any seed oil is readily detected. I would recommend that the test be performed in conjunction with the test of a sample of olive oil known to be pure. The heat should be removed as soon as the action is fairly started, and the mixture should be kept well stirred until the action is over. Should too much heat be applied, the action becomes violent and unmanageable, and some of the mixture will spurt out of the dish. This may be prevented by placing a plate or other flat body over the dish. The results obtained are never as good when the action is so violent."

Other tests are as follows:

Heat a small quantity of the oil in a beaker to about 440° F.; if lard or any strong-smelling oil is present, it will be detected by its odor.

If olive oil adulterated with poppy-seed oil is boiled, a froth will appear, which does not occur with pure olive oil.

Bechi's method, in Bulletin No. 13, United States Department of Agriculture, is excellent.

Olive oil should be stored in a cool, dark room.

ONIONS.

Onions are the bulbous roots of the onion plant, which belongs to the order *Liliaceæ* or lily family.

The native country of the onion is not positively known, some supposing it to be India and others Egypt, in both of

which it has been cultivated from the most remote antiquity. In mild climates the onion has a larger bulb and a milder and more delicate flavor, and is more extensively used for food than in cold climates.

Onions contain about 91 per cent of water and 9 per cent of solids. The solids consist of a large proportion of nitrogenous matter and uncrystallizable sugar, an acid, and a very minute quantity of a pungent, volatile, sulphurous oil, and are very nutritious. The oil is dissipated by boiling the onions in water, and boiled onions are therefore much milder in flavor than raw onions.

As a condiment or an article of food, onions agree well with some stomachs but are intolerable to others. They impart such a disagreeable odor to the breath that they are often rejected even though they are liked. Chewing a little raw parsley is said to remove this odor.

Onions used as food stimulate the organs of secretion.

Roasted onions, with oil, make a useful emollient for suppurating tumors and boils.

There are three principal varieties of onions, viz, white, yellow, and red; the latter are the best "keepers," retaining their firmness well on into spring.

Onions, when well matured, should be allowed to remain in the ground for some time, especially if the weather is dry; this hardens them and makes them better "keepers." After being pulled, it will greatly add to their keeping qualities if they are left on the ground in the warm, bright sun several days, to dry out.

To keep well, onions should be free from all defects and be dry, solid, and firm. An onion pulled before it is thoroughly mature will have more or less moisture on the outside and be soft in spots.

Overgrown onions are not desirable, generally being less firm and of poorer flavor than onions of normal size.

Onions will stand a greater degree of cold without injury than potatoes. Frozen onions, if thawed out slowly in a dark place, are not much injured for immediate use.

Onions sprout quickly when the weather becomes warm; hence at such seasons they require frequent examinations and overhauling to prevent loss from this cause.

Onions for Army use should be firm, and the outside leaves crisp. If they have sprouted, it can be determined by cutting them open. Dealers have a way of cutting off the sprout and twisting the outside leaf over the cut so as to conceal it.

For immediate use the white onions are the best, as they are the sweetest and mildest in flavor. For storage the yellow and red varieties are altogether preferable to the white, on account of their very much better keeping qualities.

In most sections of the country it is not safe to buy onions for transportation to any considerable distance between April 15 and the time when the new crop is available.

Onions are shipped in crates, ventilated barrels, or sacks. They should not be allowed to remain in sacks after receipt at destination, but should be emptied out of the sacks and spread as thinly as possible in a cool, dry place.

The best method of keeping onions is to place them, by hand, only one deep, on narrow-slatted shelves, arranged one above the other, at convenient distances apart.

Onions are of an easily perishable nature and require the best of care while in storage to prevent great loss.

OYSTERS.

The oyster is an animal of the genus *Ostrea*, of the order *Ostreidæ*. It is a mollusk with a bivalve shell and is very widely distributed, its species being found in nearly all of the seas except those of the polar latitudes. The most important species are the *Ostrea virginiana*, of the waters of the Atlantic Coast of the United States, and the *Ostrea edulis* of the European waters. The American species is larger and better-flavored than the European.

The habitat of the oyster is moderately deep water along seacoasts, generally from 7 to 30 feet deep, with a firm, gravelly, or rocky bottom. They are most frequently found in semi-fresh waters, as bays and the mouths of rivers, and necessarily in somewhat sheltered positions therein, for where the water at the bottom is agitated the beds would become covered with sand and mud and the oysters would thereby be killed.

The character and quality of oysters depend very much upon the locality and conditions under which they are grown. Sea water, with a considerable proportion of fresh water mixed therewith, is necessary to produce well-developed, fine-flavored oysters; and this condition exists in the highest degree of perfection in the waters of Chesapeake Bay, which produce oysters of unexcelled superiority of quality.

In this country oysters are grown and fattened in artificial beds. "Plants," *i. e.*, small, young oysters, are gathered during the months of August, September, and October, generally along the coast of the Carolinas, where there are prolific natural beds, in which the oysters are too small and too salt for food, being only from 1 to 2 inches long. The small oysters are taken by "dredging," and immediately carried in boats to the planting grounds, where they are shoveled overboard at such a rate as to cover the bottom, and are allowed to remain there from six to twelve months to grow and fatten. When grown and fattened, they are 4 or 5 inches long. The best and most largely used planting ground is Chesapeake Bay, which, also, has the advantage of being in close proximity to the great natural beds or breeding grounds on the coast of the Carolinas. The artificial beds or planting grounds of Chesapeake Bay cover an area of over 3,000 square miles, and the annual yield from them is generally more than 30,000,000 bushels.

In France, where the natural beds have become almost entirely exhausted, oyster farming differs from that of the United States, with its great, prolific natural beds, in one important particular, viz., in breeding oysters in artificial beds, instead of stocking them with "plants" obtained from natural beds.

The implements used in oyster fishing are the dredge, the tongs, and the fork. The dredge is used upon the natural beds, which are in deep water. It consists of an iron net set in an iron frame, furnished with teeth so arranged as to tear the oysters from their beds and gather them into the net as it is dragged over the bottom in tow of a small vessel. The dredge weighs about 150 pounds and will hold about 8 bushels of oysters. When filled with oysters, the dredge is hoisted

on board the vessel by means of a windlass arranged for the purpose. The tongs consist of a pair of iron rakes, joined together near their heads. The rakes have long handles, and the teeth are turned toward each other so as to grip the oysters. They are used in shallow water, *i. e.*, in water from 2 to 8 feet deep. The fisherman uses the tongs from a small boat, over the side of which he leans and gathers the oysters from the beds on the bottom. The fork is but little used, and only where the water is shallow and the oysters entangled in sea moss.

Oysters, after being gathered, are generally carried to oyster houses, where large numbers of hands are employed in preparing them for market. Fresh oysters, kept properly refrigerated, are shipped in the shell; also, opened or "shucked," in pails; and, also, cold-packed, in hermetically sealed rectangular-shaped flat cans.

"Drinking" oysters intended for use as *fresh oysters, i. e.*, putting them into fresh water and allowing them to remain there for awhile, for the purpose of improving their appearance, by whitening them and increasing their plumpness, impairs or destroys their flavor.

Large quantities of shucked oysters are put up, sterilized by heat, in hermetically sealed tin cans. Oysters thus put up are known as "Cove oysters," and are the kind of oysters furnished for Army use under the name of "Canned oysters."

CANNING OYSTERS.—In this country, the season for canning oysters is from October 1 to April 15. The oysters are steamed until the shell is thoroughly opened. After being "shucked," *i. e.*, after having their shells removed, they are thoroughly washed in clean water, assorted according to sizes, weighed into cans, and the interstices filled with salt water. The cans are then "exhausted" for ten minutes in boiling water (212° F.), the caps being left off during the boiling; the caps are then soldered on and the ventholes closed up with solder; they are then processed in a water bath at 240° F. from fourteen to twenty minutes, according to size of can and quality of contents.

There are two grades of canned oysters, viz, "Standards" and "Selects." The Standards are put up in 1-pound and

2-pound cans—the 1-pound cans containing 5 ounces of oysters and the 2-pound cans containing 10 ounces. This grade is composed of the smaller and poorer oysters. The Selects are, also, put up in 1-pound and 2-pound cans, but the 1-pound cans contain 6 ounces of oysters and the 2-pound cans 12 ounces. This grade is composed of the larger and fatter oysters. Canned oysters are packed in cases containing 24 cans each.

Before packing in cases, the cans are carefully inspected and all "leaks" and "swells" thrown away.

Canned oysters should never be exposed to the direct rays of the sun. They should be stored in a cool place, and to prevent the cans from rusting, the place should, also, be dry.

After oysters have been canned for a year or more, dark, greenish-yellow spots appear on them, which increase in size with the lapse of time, making them soft and rendering them unpalatable and unwholesome.

PEACHES, CANNED.

Peaches are the fruit of the *Amygdalus persica* or peach tree, which belongs to the order *Rosaceæ* or rose family. The name of the species is derived from the word *Persia*, although it is a native of China and not of Persia.

The peach grows and thrives in all warm or temperate climates. The northern limit of its growth in the United States is about 42° north latitude, or about the isothermal line of 50° F.

The principal peach-growing sections of the United States are portions of New Jersey, Delaware, Maryland, Illinois, California, and a narrow strip of western Michigan, along the eastern shore of Lake Michigan.

Peaches for canning should be ripe but firm. They should be prepared for canning, *i. e.*, peeled, halved, and pitted, by hand. After being prepared for canning, the peaches are put into cans and then sufficient sirup is added to fill the interstices. The cans are exhausted for five minutes, at 212° F.; then capped, and processed for ten minutes in the open bath, 212° F., or for four minutes in the closed bath, at 240° F.

For making the sirup refined granulated cane sugar should be used, in the proportion of about 6 pounds to the gallon of water. The density of the sirup should not be less than 10° Baumé. The quality of canned peaches is determined by both the appearance and taste of the fruit and the sirup. The fruit should have its original form without being hard, and, in a large degree, its original, fresh flavor, and the sirup should be clear and of proper density and sweetness.

Every capable packer sorts his peaches and puts up several grades, each under a particular brand or trade-mark—the best grades under cannery brands, and the inferior grades, generally, under bastard, *i. e.*, anonymous, brands.

Peaches are put up for the trade in 2½ and 3 pound cans, twenty-four cans to the case, and the packages and subpackages are well adapted to Army use.

PEARS, CANNED.

Pears are the fruit of the *Pyrus communis* or pear tree, which belongs to the order *Rosaceæ* or rose family.

The pear tree is a native of Europe, but is successfully cultivated in all temperate climates elsewhere. It has been cultivated from the earliest historic times, but all of the varieties now considered valuable are of quite recent origin, as great improvement has been made in the quality of its fruit within the last few years. Many varieties of the tree are as hardy as the apple tree, while some others are quite tender and are liable to be killed by the cold of our Northern States. There are more than 1,000 varieties of the pear in cultivation. Among those bearing the best fruit are the Bartlett, Doyenne d'Été, Flemish Beauty, Belle Lucrative, Seckel, Beurré d'Anjou, Duchesse d'Angoulême, Jarganelle, Lawrence, and Winter Nelis.

Most varieties of pears are improved in quality by being picked from the trees some days before ripening and placed in a cool, dark place to ripen. Some varieties are almost worthless if they are allowed to remain on the trees until ripe.

Pears are sold in the market either fresh or put up in hermetically sealed tin cans. They are furnished for the use of the Army in the latter form only.

The fiber of the pear is so delicate that, in canning, great care has to be exercised in its manipulation to prevent disintegrating it; and this care should begin with the gathering of the pears from the trees. The pears are hand-picked from the trees when fully grown but before they are ripe, and they are then put into bins or boxes and left there until they are ripe, which is indicated by the peculiar color which characterizes pears ripened on the tree. If pears are allowed to ripen on the tree they are liable to fall to the ground and get damaged by bruising. Pears ripened on the tree are apt to be watery, to have less flavor, and to disintegrate in processing.

Pears for canning should be carefully selected, and should be peeled and halved by hand. Sufficient refined sugar is put into the cans to furnish a rich sirup. The cans are exhausted in an open bath of boiling water for five minutes; they are then sealed and processed in an open bath of boiling water for twelve minutes, or in a closed bath, at 240° F., for five minutes.

Upon opening a can of the best quality of pears it will show an abundance of large fruit of a very light yellow, almost white color, holding its form, and a clear, fruity sirup.

Pears are put up for the trade in 2½ and 3 pound cans, twenty-four to the case, which are suitable for Army use.

PEAS.

Peas are the seeds of the *Pisum sativum* or pea plant, which belongs to the order *Leguminosæ* or pulse family.

The pea plant is an annual, climbing herb, with paripinnate leaves, papilionaceous flowers, and fruit consisting of pods of the kind called *legumes*, containing globular seeds.

The native country of the pea is unknown, but it is largely cultivated in this country and also in Europe.

Peas are used for food in both the green and dry states. They are furnished for the use of the Army in the form of "canned green peas" and "split peas."

In this country the best varieties of the pea for canning are the "Early June" and "Marrowfat."

Mode of Canning Green Peas.—The peas, while yet green but fully developed, are picked from the vines by hand and carried to the cannery where they are shelled and graded

according to size, by machinery, into the grades known, respectively, as "Standard," "Sifted," and "Extra sifted." The grading is done by means of sieves or screens with meshes of different sizes. After being graded, the peas are bleached by putting them in a perforated kettle and submerging them in a vat of hot water, and then rinsing them off in clear, cold water. They are then put into cans and the interstices filled with very weak brine, to which a little sugar has been added. The filled cans are then capped and hermetically sealed. They are then subjected to a heat of 212° F., in an open bath, for ten minutes. They are then vented by puncturing the caps. This part of the process is called "exhausting." The vent-holes are immediately soldered up and the cans are subjected to a heat of 240° F., in a closed bath, for from twenty to thity-five minutes, according to the size of the peas.

An imitation of canned green peas, called "Soaks," is made of dried peas by soaking them in water for twenty-four hours to soften them, and then canning them—processing them for thirty-five minutes in a closed bath at a temperature of 235° F. Such so-called canned green peas have a yellow color, are tough, and lack the flavor of genuine canned green peas.

In France, whence come the finest canned green peas, called "Petits Pois," the mode of canning is similar to that in vogue in this country. There the green peas are picked in the months of April and May, and are shelled and graded by machinery. The French packers make six grades, according to size, as follows, viz: "Surextra Fins," "Extra Fins," "Fins," "Moyennes," "Gros," and "Gros Gros," "Surextra Fins" being the smallest size and considered the best quality, and "Gros Gros" the largest size and poorest quality.

The grade "Extra Fins" is the most suitable for Army use.

American canned green peas are put up in 2-pound cans, twenty-four to the case; and French canned green peas, in 1-pound cans, 100 to the case.

Good canned green peas are tender, but have sufficient consistency to hold well their natural form; are of a uniform light-green color, and have a good flavor.

Canned green peas are sometimes artificially colored, and all bids based upon samples of this kind should be rejected.

SPLIT PEAS are prepared from common field peas. They are first steamed to loosen their skins, then kiln-dried, and afterwards run through a fanning mill to drive off the skins. When the skins are thus removed the peas of themselves split into halves, and are therefore called "split peas."

Good split peas should be free from hulls or skins and of a bright orange color, which is their natural color. If they are brown it indicates that they were scorched in the kiln-drying process.

The commercial packages of split peas are barrels containing 210 pounds, net, and half barrels containing 100 pounds, net.

PEPPER.

The ordinary black and white peppers of commerce are both prepared from the fruit of the *Piper nigrum*, a perennial, climbing shrub which grows spontaneously on the Malabar Coast, and the culture of which has been extended to Siam, Hindostan, Indo-China, the islands of Ceylon, Sumatra, Java, Borneo, and to some extent to Guiana, in South America. The greatest production is in the Island of Sumatra. The principal ports of exportation are Singapore and Penang. The port of exportation of Malabar pepper is Tellichery.

There are at least five commercial varieties of pepper, named after the ports of exportation or the localities where grown, as follows, viz, Malabar, Penang, Sumatra, and Tellichery.

The differences which several varieties of pepper present to the eye are evident enough when the several samples are at hand for comparison, but it takes an expert to identify a solitary sample; and if several kinds are mixed together it is doubtful if an expert could separate the peppercorns again, identifying each kind correctly. The best method of judging of the quality of peppercorns is that in use in the trade, viz, by weight.

Our imports of peppercorns are principally through England, and not direct; and in that country the following mixture is in vogue: Malabar for weight, Penang for strength, and Sumatra for color.

All the ground peppers of commerce are mixtures of different kinds of pepper; there is no such thing as a pure ground Malabar pepper or a pure ground Penang pepper.

To Prepare Black Pepper.—The berries which are designed for making black pepper are picked after they have attained a good size, but while they are still green. They are thrown upon a latticework of bamboo, which is placed over a furnace, the heat and smoke from which pass through the peppers and both dry and color them. The berries are next detached from the stems and sifted, and then packed in bags for shipment; and the dried berries in this form are the black peppercorns of commerce.

To Prepare White Pepper.—The berries are allowed to remain on the vines until they are ripe. Immediately after picking, they are thrown into shallow trenches or ditches containing water, where they are allowed to soak for ten or twelve days. By that time the pulp is much decayed and the skin and pulp are readily loosened and separated from the seeds or kernels. When dried, the kernels are of a greenish-white color, but they are frequently given another bleaching by chlorine, which improves their appearance, but at the expense of the quality; and the dried kernels, when thus prepared, are the white pepper of commerce.

The process by which the white pepper is prepared is much more tedious and expensive than that of preparing black pepper. White pepper is less pungent than black, as the essential constituents of the spice are more abundant in other parts of the fruit than the seed, but the flavor is said to be finer. White pepper is chiefly prepared in the island of Rhio, but the finest comes from Tellichery.

Pepper is either ground by the millstone process or with an apparatus similar to a coffee mill. The latter mode is far preferable to the former, as the friction of the stones develops considerable heat, which dissipates some of the aromatic principles of the pepper. Pepper thus damaged by heat generated in grinding is technically called "burnt."

Advertisements inviting proposals for ground pepper for Army use should require the pepper in the berry to be resifted before grinding.

Ground pepper is apt to be adulterated and great care should be exercised in its purchase.

Ground black pepper is the only form of the fruit of the plant of the genus *Piper* that is furnished for the use of the Army. It is packed in ¼-pound tins, forty-eight to the case, and ½-pound tins, twenty-four to the case.

PEPPER, RED.

Two kinds of so-called red pepper are furnished for the use of the Army, viz, Cayenne and Spanish, the latter being officially designated as "Chile Colorado," which is its Spanish name.

They are prepared from the fruit of the *Capsicum*, and not from the fruit of the *Piper* or pepper genus of plants.

Capsicum, of which there are several species, belongs to the order *Solanaceæ*, which also includes the nightshade, the potato, the tomato, and the tobacco plants.

Cayenne red pepper is prepared from the pods of two large-pod species of *Capsicum*, viz, *C. frutescens* and *C. annuum*, but chiefly from those of the latter. The supply of *C. annuum* comes from Zanzibar and Natal.

Cayenne red pepper, for Army use, is required to be put up in 2-ounce bottles.

Spanish red pepper, or Chile Colorado, is prepared from the pods of a small-pod species of the capsicum, viz., *C. fastigiatum*, which grows wild in South India, and is cultivated in tropical Africa and tropical America. The supply for the use of the Army is procured in New Mexico.

The outer skin of the ripe pods of the Chile Colorado, when dried in the sun, is of a rich, dark-red color, and has a smooth, oily appearance. The pods contain numerous small, flat seeds of much lighter color than the skin. The pods are attached to the stalk by a thin, fine stem. The stem and seeds are but slightly pungent as compared with the skin, and should not be used in preparing the manufactured article; and, if so used, are to be considered as adulterants. It is alleged by some that, because of the oily nature of the skins, it is necessary to mix corn meal with them in order to grind them, but experience has disproved this; and when corn meal is so used

it is, also, to be considered as an adulterant. As much of the Chile Colorado is ground by hand by the growers, it is difficult to obtain it free from ground seeds.

For Army use, Chile Colorado is required to be put up in ¼-pound tin cans.

PIGS' FEET.

Pigs' feet are first cleaned and put into brine of mild strength, about 65° Baumé. When properly cured they are put into wooden vats and cooked with steam; they are then taken out, split, and trimmed. All very hard or very tough feet are thrown out. They are then put into barrels, kegs, or kits, as may be desirable, and covered with vinegar of 50° Baumé in strength.

All wooden receptacles should be thoroughly silicated on the inside before being used, for the purpose of preventing the vinegar from coming in contact with the wood. The vinegar will, however, in the course of time, more or less affect the wood and become what is termed "wood-tainted," and, consequently, pigs' feet should not be kept on hand any great length of time. The receptacles should be frequently examined to see that the vinegar has not leaked out, and, after being opened, care should be taken to keep the pigs' feet covered with vinegar.

Pigs' feet are also put up in glass jars. When they are put up in this style, the large bones are taken out and the vinegar jellied, so that the contents of the jars are nearly one solid mass. Spices and other flavoring materials are used in varying proportions, according to the recipes of different manufacturers.

Vinegar-pickled meats should not be put up in tin cans, as the acetic acid would corrode the tin.

Pigs' feet in the fresh state, like any other fresh meat, may be put up in tin cans; but when put up in this style the bones should first be removed.

For Army use, pigs' feet are furnished fresh, in 2-pound cans, and pickled, in 15-pound kits.

PINEAPPLES, CANNED.

Canned pineapples are prepared from the fruit of the *Ananassa sativa* or pineapple plant, a perennial herb which grows

in tropical and semi-tropical countries, and is cultivated mainly for the sake of its large, juicy, aromatic, multiple fruit. The fruit has a leafy shoot on its apex, which may be used as a "cutting" for the purpose of propagation. Seeds are very rarely developed. The fiber of the leaves is used for making cloth. The pineapple plant is so called from the resemblance of its fruit, in shape and external appearance, to the cones of the pine tree.

The pineapples consumed in the United States come mostly from Singapore, in Asia, Nassau, in the Bahama Islands, and the State of Florida. They are extensively canned in all of these places, and also in the city of Baltimore, Md.

Pineapples are too soft, when ripe, to stand transportation, and, for shipping, are, therefore, always picked while green.

Canned pineapples are better the second or third year than the first, because it takes time for the sirup to thoroughly permeate the fruit; indeed, many acid fruits which when first packed are a little hard, become mellowed with time and the absorption of the sirup.

Pineapples are canned in the whole and also in the sliced form. Preparatory to canning them, they should be peeled and the eyes and the woody core removed. The cans are filled with the prepared fruit, and the interstices are then filled with a clear, heavy sirup made of water and refined cane sugar. The cans thus filled with fruit and sirup are capped, hermetically sealed, and subjected to a heat of 212° F. in an open bath. They are then vented by puncturing the caps. This part of the process is called "exhausting." The vent-holes are immediately soldered up and the cans are subjected to a heat of 212° F., in an open bath, for twenty minutes; or, to a heat of 240° F., in a closed bath, for eight minutes.

Canned pineapples of the best quality have little woody fiber and are of a light-yellow color, with a decided flavor of the fresh fruit; the sirup is clear, heavy, and fruity.

Canned pineapples are put up for the trade in cans of different sizes, from 1-pound to 3-pound, and generally packed in cases containing twenty-four cans each.

For Army use, canned pineapples are purchased only in 2-pound cans, in cases containing twenty-four cans each.

PIPES, BRIER-WOOD.

Brier-wood pipes are the only kind of pipes kept by the Subsistence Department, for sale to officers and enlisted men of the Army.

They are kept in four sizes, viz, Nos. 1, 2, 3, and 4. Nos. 1 and 2 have short, detached stems, with curved mouthpieces. The stems and mouthpieces are in one piece, and are made of vulcanized India rubber. No. 3 has a short, attached stem, with a curved mouthpiece. The stem and mouthpiece are in one piece and are made of vulcanized India rubber. No. 4 has a short stem with a straight mouthpiece. The bowl and stem are in one piece, and the mouthpiece is made of vulcanized India rubber.

Brier-wood pipes are made in three grades, viz, "Firsts," "Seconds," and "Thirds." The firsts, which is the only grade purchased by the Subsistence Department, are made of the best quality of wood and other materials, and are finely finished and free from defects. The seconds and thirds are defective in the quality of the wood or other materials from which they are made, or in the workmanship, or in both of these particulars.

In inspecting brier-wood pipes to be delivered under contracts with the Subsistence Department, care should be taken to see that they have no defects, such as small holes or cracks in the wood, which have been concealed by plugging or filling, and that the boring is smooth and accurate.

Brier wood is the root or burl of the brier, and is distinguished from apple wood and other similar woods used in the manufacture of pipes by the peculiarity of its grain, which is curled and knotty, while in the others the grain is straight. All brier-wood pipes show the peculiar grain of the burl very plainly, but they differ considerably from each other in depth of color, depending on the part of the root from which they are made. Those made from the lower part of the root have a darker or deeper color than those made from the upper part. There is not, however, any difference in price on account of variation in depth of color.

They are put up in cartons containing twelve pipes each, and four of these cartons are packed in a wooden box or case.

PIPESTEMS.

Weichsel pipestems, 4 inches long, with curved, vulcanized-rubber mouthpieces, are the only kind of pipestems kept by the Subsistence Department, for sale to officers and enlisted men of the Army.

Weichsel grows in Austria and Germany, and the weichsel pipestems are all made in those countries. They are all made in two grades, based on the quality and materials used and the quality of the workmanship in their manufacture, viz, "Firsts" and "Seconds." The firsts, which alone are purchased by the Subsistence Department, are made up of the best materials, and are faultless in workmanship. The seconds are deficient in the materials used in their manufacture, or in workmanship, or in both. They are, also, graded according to thickness of stem, as thin, medium, and thick, and are priced accordingly.

Weichsel pipestems are put up in cartons containing twelve pipestems each. The mouthpieces are detached to prevent breakage, and are put up in the cartons with the pipestems to which they belong. Four of these cartons are packed in a wooden box or case.

PORK.

Pork is the flesh of the hog.

The hog (*Sus scrofa*) is a small-sized pachyderm, whose most distinctive physical features are a bristly skin and a nose ending in a flattened, cartilaginous disk or earth-excavator; and whose most distinct physiological characteristic is an extraordinary power of secreting fat when well fed.

The hog is a gluttonous animal, and, with the exception of the duck and the chicken, is the most indiscriminate in its diet of all the domesticated food animals. The nature of the food upon which a hog subsists strongly influences the quality of its flesh. It has been found that when a hog has the free range of virgin forests, where it finds its natural foods, such as acorns, beechnuts, sweet chestnuts, roots, etc., its flesh

acquires a peculiar flavor that is highly prized; and it is for this reason that the flesh of the Virginia hogs, which have the range of such forests, has obtained a celebrity for excellence of quality equal to that of the Westphalia hogs, which feed on similar foods.

Milk alone will fatten hogs, and, when thus fattened, their flesh is of the most delicate flavor. The flesh of grain-fed hogs is next in delicacy of flavor to the flesh of milk-fed hogs. The flesh of hogs fed on peas is good, but that of hogs fed on beans is hard and bad-flavored. The flesh of hogs fed on potatoes is insipid, and that of hogs fed on offal, swill, or on slops from kitchens, breweries, etc., is too soft and has a strong, unpleasant flavor and a similar odor.

TO INSPECT FRESH PORK.—Take a thin slice of the lean meat between the forefinger and the thumb, and give it a smart squeeze; if the meat yields readily to the pressure, it is of good quality, and if it does not so yield, it is not of good quality. The meat should be of a pale-red, and not of a dark-red, color, and the rind should be thin and of a delicate texture. Freshness is indicated by transparency and by freedom from green tint and unpleasant odor.

MEASLY PORK.—Measly pork is the flesh of slaughtered diseased hogs, and is recognized by the enlarged glands in the fat portion, called "kernels," and by the little specks of matter yielded by the lean portion upon pressure. Measly pork is unwholesome and unfit for use as food.

Corn-fed pork is the best quality of pork found in the general market. It can be distinguished from mast, slop, or swill fed pork by its pearly appearance, and by its retaining the dent of the thumb or finger on pressure; mast-fed pork has a blue tinge, is spongy, and gives back "squirms" on pressure.

When slaughtered and dressed, hogs six weeks old are called "roasting pigs," and those over six weeks but under one year old, "shoats," and their meat, "shoat pork." The meat of the full-grown hog is, when it is fresh, called "pork," and after it is cured is called "salt pork" or "pickled pork," or "bacon," according to the mode of curing.

The principal pork-packing points in this country are the cities of Chicago, Kansas City, and Omaha. The methods of

packing pork pursued in these places are very similar. The buildings are of large size and strongly constructed. In those of three stories the lower floor is used for curing and storing the material, the second floor for packing, and the third for cooling and cutting up the hogs. The roof is constructed flat, very heavy, and tight. Some roofs are divided off into yards or pens that will hold as many as four thousand head. The animals are driven up an inclined plane to the pens on the roof, where they are held until the time comes for killing them. They are usually killed the day following their arrival at the packing house, as it has been found that, if kept long in the pens, they crowd together, and that numbers are smothered or otherwise killed by excessive crowding.

When all is ready for the killing the hogs are driven, about twenty at a time, into a small pen at the hog entrance to the building, and are slaughtered in succession, as follows, viz:

A man, with a grappling iron, catches a hog by one of its hind legs; another man, by means of a lever, raises it from the floor; and a third man, with a butcher knife, "sticks" it. It is then slid slowly along toward the scalding vat by means of an overhead-railway track, the blood flowing into a gutter and being conducted by spouts to large tanks to be used for making fertilizer and for other purposes. After having bled sufficiently, the hogs are slid down an incline plane directly into one end of the scalding vat. The scalding vat is made of wood and is about 6 feet wide, 20 feet long, and 3 feet deep. The water in the scalding vat is heated and kept at a regular temperature by means of steam pipes. The hogs in the scalding vat are floated along and turned by men standing on opposite sides until they reach the other end, when they are taken out in succession by a simple contrivance operated by a single man and deposited upon the end of a long, inclined table. Two men stand ready and take from the back of each hog, in an instant, all the bristles that are suitable for the brushmaker and the shoemaker, depositing them in boxes and barrels, for removal. Another pair of men, standing on opposite sides of the table, divest another part of the hog of its hair, and so on, through the hands of some eight or ten pairs of men, who have each a different part to perform in the cleansing of the hog, until

it reaches the last pair, who put in the gambrel stick and swing it to a traveler on the track of an overhead railway, where it receives a shower bath of clean, cold water and a final scrape with knives. It then passes along, on the track of the overhead railway, to a man who opens it and removes the large intestines, heart, lights, etc.; the hog then receives a thorough drenching with water and passes to another man, who splits it down the backbone. At this stage a man loosens up the leaf fat, ready to be removed when the hog is cooled, which, together with the splitting of it down the backbone, hastens the cooling. It is then run by means of overhead railways to another room to cool. The hogs are allowed to hang in the cooling room for about two days before being cut up. The fat on the small intestines is removed, and, after being washed, it is ready to be placed in the lard-rendering tank.

After cooling, the dressed hogs are ready to be cut up and are carried from the cooling room to the cutting room, each being weighed as it is brought up, and a record being made of its weight. A hog having been placed on the cutting block, one stroke of a large cleaver severs the head, another severs the saddle or hind parts containing the hams, another cuts it open along the back, and then one is given for each leg. The leaf fat, being already loosened, is now stripped from the carcass. The remainder of the hog is then cut up for making the various kinds of meat for which it is most suitable. These operations are continuous, and for each hog take but a few moments of time.

Barreled pork is designated, according to the cuts of which it consists, as follows, viz, mess pork, prime mess pork, extra-prime pork, light mess pork, extra-shoulder pork, extra-clear pork, clear pork, clear-back mess pork, and rumps.

Pork is also made into sausages. To make sausages, a mixture of about one-third fat, and two-thirds lean, meat, is chopped or ground in a sausage mill, and then seasoned with black pepper, powdered and sifted sage, cloves, mace, and nutmeg, to suit the taste. Factory-made sausages are not nearly as good as homemade.

The kinds of pork generally used in the Army are mess, light mess, and prime mess.

Mess pork is made from the sides of well-fatted hogs, numbering not over sixteen pieces to the barrel.

Prime mess pork is made from the shoulders and sides of nice, smooth, fat hogs, weighing from 100 to 175 pounds, net. regularly cut into square pieces of as near 4 pounds each as possible, in the proportion of twenty pieces of shoulder and thirty pieces of side cuts.

Light mess pork is made from the sides of reasonably well-fatted hogs, and as many as twenty-two pieces of uniform size may be packed in a barrel.

To make mess pork or light mess pork, the hog is first split through the backbone, or if split on the side, an equal proportion of hard and soft sides, as they are termed, properly flanked and not back-strapped, must be packed in each barrel.

If pork is packed between the first day of October and the last day of February, inclusive, 190 pounds of green, *i. e.*, uncured, meat, including the regular number of flank and shoulder cuts, placed in four layers, on edge, without excessive crowding or bruising, must be packed in each barrel, with not less than 40 pounds of coarse salt (Turk's Island or its equivalent), and the interstices filled with brine of full strength; or with 45 pounds of coarse salt, and, in addition thereto, 15 pounds of ordinary salt, and the interstices filled with cold water. If pork is packed in March, 193 pounds of green meat must be packed in each barrel.

At some packing houses, prior to cutting up the pork and packing it into barrels, the sides are cut into strips longitudinally, and packed in large casks or vats filled with brine, and left for from eight to ten days to extract therefrom the blood. When ready for barreling, each strip is carefully cleaned with a knife or a brush, and cut into pieces of proper size and weight for packing. After packing, pork should be kept from forty to fifty days, in a temperature of about 40° F., to absorb and become thoroughly impregnated with the brine; and, when cured, the 190 pounds of green meat originally put into the barrel should weigh 200 pounds, the net weight of a barrel of pork.

Pork not thoroughly cured is unmarketable, and should not be accepted on contracts.

If winter-packed barreled pork is frozen before it is thoroughly cured, it will spoil when it is thawed out. The freezing of the pork suspends the curing process, leaving the inner portions of the pieces uncured, which, upon the thawing of the pork, become centers of putrefaction. Similarly, if summer-packed barreled pork is removed from the chill room before it is fully cured, the uncured inner portions of the pieces become centers of putrefaction.

Light mess pork, being made from smaller and less-fattened hogs than mess pork, is less fatty and more palatable than mess pork, and, therefore, more desirable for Army use.

To Inspect Barreled Pork.—Open six barrels taken at random from each one hundred, or the same proportion from a lot of less than one hundred barrels. Remove the pork from the barrels, placing it on a rack; let the pickle drip from the pieces; remove any salt that may adhere to them and then carefully weigh and "try" them. Fully cured pork, from absorption of brine, will, previous to August 1, weigh from 203 to 208 pounds to the barrel. Barrels of pork should always contain plenty of undissolved salt and the brine should always be of full strength. All barrels that are opened for inspection should be carefully repacked and well recoopered. It is not advisable to open more than six barrels to the hundred, as recoopered barrels are more liable to leak in transportation than those that remain unopened, but the bungs of all barrels should be opened and the brine tested.

Pork barrels should be made of well-seasoned white oak or burr oak, which is free from objectionable sap; the staves should be $\frac{5}{8}$ inch thick and 29 or 30 inches long; the heads should be 18 inches in diameter, 1 inch thick in the center, and $\frac{3}{8}$ inch thick at bevel; and the hoops should be of hickory or white oak. The barrels should be hooped not less than eleven-sixteenths of their entire length.

Storage of Pork.—Pork should, if possible, be stored in cellars, and if no cellars are available, on the first floor of the building. It should not be stored more than two tiers high. If there is plenty of floor space tiering should not be resorted to, as when thus stored it is not easy to "roll" it. The temperature of the storeroom, to prevent the pork from freezing, should not be lower than 36° F.

To "roll pork" means to roll the barrels containing pork, on their skids, through a distance equal to one-half the circumference of a barrel, and thereby reverse the position of the barrels and the pork with reference to the brine. The object of rolling pork is to equalize the exposure of the inside of the barrels and the pork to the action of the brine, and thereby preserve the integrity of the barrels and the pork. If, in rolling pork, the rattle of salt striking against the inside of the barrel is heard, it indicates a deficiency of brine. Barrels deficient in brine should be filled up therewith immediately and marked for early issue or use. Pork should be rolled weekly.

To Tier Pork.—When, for lack of space, it is necessary to tier pork and have suitable convenience in rolling it, place the first tier upon skids on the ground; sink posts in the ground at equal intervals and place the skids for the second tier upon these posts, leaving an interval of 4 inches between tiers; leave at one extremity of each tier a space equal to one-half the circumference of a barrel, and so continue to build tiers as long as it is consistent with the strength of the structure. Any tier can then be rolled separately without disturbing any other tier. By building these structures pork can be stored four or five tiers high and space correspondingly economized. One man can roll the barrels.

To Repack Barreled Pork.—To repack barreled pork, take all of it out of the barrel, pour out all of the brine and salt, and rinse and recooper the barrel; after scraping off the discolored parts of the pork, reweigh and repack it in the barrel in layers, covering each layer with a layer of dry, coarse salt, about ½ inch thick; head up the barrel and place it on one of its chimes, bore a hole in the upper head, and through a funnel placed in the hole fill the barrel with brine. New brine, when practicable, should be used in repacking pork. If, however, for want of salt to make new brine it is absolutely necessary to use the old brine, it should first be boiled, skimmed, and cooled, and then run through a brine filter, hereafter to be described. No sour, *i. e.*, spoiled, pieces of pork should be replaced in the barrel.

TO MAKE BRINE.—The best way to make brine is with a brine filter. To make a brine filter: Take the head out of one end of a water-tight barrel or cask and set it upright upon a foundation about 2 feet high; place in the barrel or cask, set on blocks about 10 inches high, a perforated false bottom; over the false bottom spread several thicknesses of gunny-sack cloth; and provide the lower compartment with a cock. To make brine with this apparatus, partly fill, according to the amount of brine required, the upper compartment of the filter with salt, and let the water in at the top; it then filters through the salt and becomes saturated with it; it then passes through the gunny-sack cloth strainer, which takes out all solid matter; and it is then deposited in the lower part of the filter, from which it is then drawn off for use through the cock provided for the purpose.

Saturated brine has a density sufficient to float an egg. Brine of less strength should not be used for packing, repacking, or rebrining pork. Sour brine, *i. e.*, contaminated by spoiled pork, can be detected by the taste.

Pork and other meats preserved by means of brine are not safe from injury unless there is undissolved salt in the barrel in sufficient quantity to maintain its maximum or saturate strength. The marrow of meat should never be frozen, as the brine can not then be absorbed thereby, and the meat, upon thawing, will become tainted at the bone and progressively outward. Such meat should never be packed.

BACK-STRAPPING.—By back-strapping is meant the cutting off of wedge-shaped strips of fat, for rendering into lard, parallel to and above the backbone, and thus leaving a less proportion of meat.

Properly flanked means the removal of the thin portions of the belly, which are used in making breakfast bacon. The regular proportions of flank and shoulder cuts are about as follows: In mess pork, from three to four shoulder cuts to each sixteen pieces in the barrel; in light mess pork, from five to six shoulder cuts to twenty-two pieces, or in that proportion.

When a barrel of pork is opened for use, the meat remaining in the barrel should always be kept completely covered with

brine. While barreled pork, by great care and attention, can be kept sound and sweet for years, it is not advisable to purchase more than is required to last from one packing season to another, say from December 10 of one year to December 10 of the next year. Winter-cured pork is undoubtedly the best for long storage, and by "winter-cured" is meant that which is cut, packed, and cured between November 1 and March 1. The pork cured in a temperature produced by artificial means, say after the winter is over, is as good in every respect for immediate use as the winter-cured, but it will not keep as long.

The supply of winter-cured pork is not, as a rule, exhausted before the new supply comes in, as packers generally manage to keep it on hand in sufficient quantity to supply such customers as prefer it and are willing to pay the greater price it commands. The purchase of summer-cured pork is not necessary, except in rare cases when a sudden call is made for immediate delivery.

Each barrel of pork is required to be plainly marked with the name of the packer, the number of pieces in the barrel, and the date of packing.

POTATOES.

Potatoes are the esculent, farinaceous tubers of the *Solanum tuberosum* or potato plant, which belongs to the order *Solanaceæ* or nightshade family.

The potato plant has been found growing wild in Chile, Peru, and Mexico. It was brought to Ireland by Sir John Hawkins, in 1565; to England by Sir Francis Drake, in 1585; and again to England, in the following year, 1586, by Sir Walter Raleigh.

Gerard figured the plant and named it *Batata virginiana*, in his "Herbal," published in 1597. With respect to this name he said: "We have the name proper to it mentioned in the title, because it hath not only the shape and proportion of potatoes [meaning the tubers of the *Batata convolvulus* or sweet-potato plant], but also the pleasant taste and virtues of the same; we may call it, in English, 'potatoes of America or Virginia.'" It did not, however, belong to the genus

Batata, nor was it a native of Virginia. It has since been properly identified and named, botanically, as *Solanum tuberosum*, but it still retains the English form of its first botanical name, "potato," as its common name.

Another notable fact with regard to the nomenclature of nightshade potatoes is that, although the plant bearing them is not a native of Ireland, they are generally called "Irish potatoes," presumably because of their early cultivation in Ireland, or because they are used more largely as food in Ireland than in any other country.

About the year 1600, and for some time afterwards, the convolvulus potato was spoken of as the "common potato," and the nightshade potato, as the "new potato of Virginia;" and the latter did not become popular as an article of food until the close of the eighteenth century. Now the conditions are reversed, and the nightshade potato has become the common potato, and the convolvulus potato the scarce potato.

The chief value of the potato as an article of food is due to its starch and, to a less extent, to its potash and other salts. The quantity of nitrogen in its composition is small, and hence it should not be relied on as a staple article of diet, except in admixture with milk or some other substance containing nitrogen.

The starch and its proportion to the watery elements of the potato furnish a means of determining its cooking qualities; and, also, whether, after cooking, it will be wet and soggy or dry and mealy. With a sharp knife cut the potato as nearly through the center and as nearly perpendicular to its axis as possible; turn the cut surfaces of the two parts toward you, and observe their condition as to moisture; if there is more than a slight moisture, hold the two cut surfaces at an angle with the floor, and if the moisture is sufficient to drip, the potato will be soggy and poor when cooked.

After testing a potato for moisture, as above explained, place the cut surfaces of the two parts together and rub them together with a circular motion, and a white froth of a character indicative of the quality of the potato will form around the edges of the parts. A good, rich potato will give a thick, tenacious froth, and a weak, watery one a weak, watery froth.

Then stick the cut surfaces together, and the degree of richness of the potato will be shown by the greater or less tenacity with which the parts cling to each other. All of these tests are indicative of the proportion and quality of the starch, upon which the quality of the potato depends.

There is very great diversity in the quality of potatoes, depending on the variety, and the soil, climate, etc., of the place of growth; and careful inspection by a competent inspector is therefore necessary.

The best method of determining the quality of potatoes is by cooking them. To cook potatoes, place them in cold water, add a little salt, bring the water to the boiling point, and keep it at that temperature until the potatoes are soft enough to be easily penetrated with a fork, and, when cool, test by taste and appearance. Potatoes, when cooked, should be dry and mealy.

The specific gravity of potatoes should be greater than that of water containing 2¼ ounces of salt to the pint. Other things being equal, the greater the specific gravity of potatoes the better their quality. The skin should be smooth and firm; lack of firmness indicates a lack of maturity. They should be free from wormholes, and dry or moist rot, the latter especially, as one such diseased potato will spoil all that come in contact with it. They should be firm and should cut with considerable resistance, showing brittleness rather than the reverse. Potatoes raised in a dry, sandy soil are better in quality than those raised in a wet, heavy soil.

If potatoes have sprouted, it can be detected by a close examination of the eye, or by cutting just under the skin; the base of the eye enlarges inside as the potato sprouts, and sprouted potatoes generally present a shriveled appearance.

Potatoes should be of medium size. The very large ones are coarse and very often hollow, and with very small ones, if peeled before cooking, the loss is considerable.

Just before new-crop potatoes come into market there is a period when it is almost impossible to get old-crop potatoes of good quality.

Potatoes for Army use are shipped in sacks or crates. For shipment to distant posts the crate is the best receptacle.

Potatoes should be stored in a cool, dry, and well-ventilated place, and should not be exposed to the light any more than is necessary.

PRESERVE, DAMSON.

Damson preserve or, more accurately, damson-plum preserve, is prepared from the fruit of the damson or Damascus plum tree. The name "damson" is a contraction of the word *damascene*, the adjective form of the word *Damascus*, the name of the ancient capital of Cœle-Syria, celebrated for its terebinths, plums, and fabrics in steel.

The damson-plum tree is a variety of the *Prunus domestica*, and is supposed to have been imported into this country from England. Its fruit is a medium-sized drupe, ovoidal in shape, and, when ripe, has a smooth, dark-purple skin covered with a thick blue, bloom. Its flesh is melting, juicy, and subacid; and the plum, therefore, makes a tart, delicious preserve.

TO MAKE AND CAN DAMSON PRESERVE.—The formula for making and canning damson preserve is nearly identical with that for making and canning blackberry jam, heretofore given—the only difference being that a greater proportion of sugar (about 90 pounds of sugar to 100 pounds of plums) is used in måking the preserve.

Damson plums ripen in August or September, which is the season for making and canning damson preserve.

It is put up, for Army use, in 2-pound cans, twenty-four to a case.

PRUNES.

Prunes are dried plums of the better varieties. They are largely produced in France, Germany, Spain, and Turkey, and, latterly, to quite a large extent in Oregon and California.

To prepare prunes for the markets the plums, when ripe, are shaken, and not picked, from the tree. They are then placed in wire baskets and dipped for half a minute in a hot, weak solution of lye (1 pound of concentrated lye to 20 gallons of water), to cut or break the skin, and at once rinsed in water. A new process is now often substituted for the lye-dipping process. It involves the use of a revolving cylinder, into which the fruit is fed through a hopper. The inner surface of the cylinder is studded with numerous short, sharp-pointed

pins, and as the plums pass over them the skin is perforated. It is claimed that this process produces sweeter and better prunes than the lye-dipping process. After the skins are broken the plums are placed on wooden trays and dried in the sun, the drying process requiring from one to two weeks, according to the intensity of the sun's rays; the plums are then placed in bins to sweat, and, after sweating thoroughly, they are finished or glossed, by dipping them in a hot solution of either sugar and water, honey and water, glycerin and water, or isinglass and water; but, latterly, the diluted juice of the prune, obtained by soaking prunes in water, is being used for this purpose. The "dipping" usually takes place immediately before the prunes are packed, and is for the purpose of improving their appearance and killing insect eggs.

Old and stale prunes are hard and much shrivelled, and dealers frequently resort to redipping, which restores the gloss, but not the softness and smoothness of the freshly packed prune.

To secure uniformity of size the plums are run through graders as soon as taken from the trees, and also a second time after they are dried. They are graded as 40's, 50's, 60's, etc., *i. e.*, in sizes averaging from 40 to 50, 60 to 70, etc., to the pound when dried. These sizes are about the largest now grown, but some are so small as to average as many as 120 to the pound.

As prunes are not pitted, and as the pits are often as large in the smallest as in the largest prunes, the latter are much the more valuable.

Good prunes are of a uniform size and a dark, almost jet-black color. The "silver" prune is an exception to this rule, being of a light color and of a good quality, but it is commercially rare. Good prunes have a thin, soft, and pliable skin, and an abundance of meat of a rich, delicately sweet flavor. Some fine-looking, large-sized prunes have a thick skin with a large pit and little else.

Prunes are usually put up for the trade in 25-pound boxes. If properly cured they will keep a year.

They should be stored in a cool, dry place.

RAZOR STROPS.

The razor strops furnished for the use of the Army consist of two parts or, rather, two strops combined in one implement. One part or strop is made of Russian horsehide leather, and the other of linen-duck hose canvas. The two parts or strops are sewed together at the ends and form a continuous belt. One end is provided with a wooden handle, and the other with a swivel eye for attachment to a hook, placed in a convenient position for use, in a wall or other firm object. By means of the swivel the razor strop is readily reversed by the operator. The metallic fixtures are made of brass and are plated with nickel.

The razor strops are kept in proper order for use by applying lather from the shaving cup to both the leather and the canvas parts twice a week with a shaving brush, and afterwards rubbing them with a stick of especially prepared lead, which is furnished with each razor strop. A small tin tube containing an oily dressing for occasional use on the leather part of the razor strop is also furnished. To use the dressing, take enough of it from the tube to cover the tip of the forefinger and apply it on both sides of the leather part, evenly distributing it by rubbing. A razor strop should not be used within an hour after applying this dressing. This dressing should be used only when a proper edge on the razor can not otherwise be obtained.

These razor strops, when properly stored, are warranted to keep in good condition for five years.

They are put up separately in cartons, twenty-four cartons to a case.

RICE.

Rice is the seeds of the *Oryza sativa* or rice plant, which belongs to the order *Gramineæ* or grass family.

It is an annual, growing, under favorable conditions, from 1 to 6 feet high, according to the variety. It is a marsh plant, and the best rice-growing grounds are in the low, flat-lying regions of country where water is abundant and irrigation practicable.

Rice has been cultivated from the remotest antiquity, and, like many other plants of ancient cultivation, its native

country is unknown. It is now cultivated in favorable localities all over the tropical and subtropical regions of both hemispheres, and furnishes the principal article of subsistence for more than three-fourths of the population of the world.

Rice was introduced into the United States in 1694. In that year, a vessel from Madagascar took refuge in the harbor of Charleston, South Carolina, and the captain thereof presented a bag of rough rice or "paddy" to one of the citizens, who planted it; and the crop being a success, the seed was distributed and the cultivation of the plant spread rapidly, not only over South Carolina, but all over the Southern States.

Rice is cultivated very much in the same manner as other small grains. When it reaches maturity, it is cut with the sickle or cradle, and spread evenly on the stubble, where it is allowed to remain for a day, or until it is thoroughly dry. It is then bound into sheaves and put into shocks like wheat. It is then thrashed in the field, or hauled to the barnyard, stacked in ricks, and thrashed there. The operation of thrashing only removes the outer husk, the inner one being attached to the grain. The grain is winnowed and is then ready to be taken to the mill. In this state it is called "rough rice" or "paddy."

To separate the inner husk from the grain requires the use of expensive machinery, and all planters, therefore, take the rough rice to the pounding mills to have it cleaned. The rough rice is first ground between very heavy stones running at a high rate of speed, which partly removes the hull chaff. This chaff is conveyed out of the building by means of spouts, and the grain is conveyed by similar means into mortars, where it is beaten or pounded for a certain length of time by the alternate rising and falling of very heavy pestles shod with iron. From these mortars elevators carry the rice to the fans, which separate the grain from the remains of the husks. From here the rice goes to the fans, which divide it into three qualities, "whole," "middle," and "small." The whole or head rice is then passed through a polishing screen lined with gauze-wire cloth and sheepskins, which, revolving vertically at the greatest possible speed, gives it the pearly

whiteness which characterizes it. From the polishing screen the rice falls directly into a tierce which is slowly revolving, and is struck at intervals on opposite sides with heavy hammers to settle the rice firmly in the tierce and enable it to be properly filled. These tierces contain about 600 pounds of rice. Broken rice, if freed from grit, is about as good food as the whole rice, but it is not nearly so sightly, either in the raw or in the cooked state.

The composition of Carolina rice, according to Bracannot, is, by weight, as follows, viz:

	Per cent.
Starch	85.05
Gluten	3.60
Gum	0.71
Crystallizable sugar	0.29
Fixed oil	0.13
Cellulose	4.80
Water	5.00
Saline substances	0.40
Total	100.00

Although rice constitutes so grêat a proportion of the food of the human family, it is with us used very largely as a luxury in the form of puddings, cakes, soups, etc. It is easy of digestion, and therefore an excellent food for invalids.

Rice should not be cooked by boiling, but by steaming until tender, because it yields to the boiling water a considerable part of its nitrogenous and mineral constituents, in which it is naturally deficient in quantity. But this objection to cooking rice by boiling does not apply to its use in making soups, in which all of its extracted constituents are, of course, retained.

The best varieties of rice in the markets of the United States are "Carolina" and "Louisiana," of domestic growth; "Island," from the Sandwich Islands, grown from Carolina seed; "Rangoon," from Burmah; "Siam," from Siam; "China," from China; and "Japan," from Japan. As a rule the large-grain varieties command the highest prices; an exception is China No. 1, "Sim Yue Jim," which has smaller grains and commands a higher price than No. 2, "Long Ah Jim." Island and Carolina resemble each other; Rangoon is more of a dead

white and less pearly, as are in a less degree China and Siam. Japan is more ovoidal and flatter; is of a beautiful, regular, pearly appearance, and requires a longer time to cook. The characteristics of good rice are semi-transparency, no grit, dust, or hulls, and few broken or dead-white grains.

A good, clean, fresh-milled head rice is required for the Army. When purchasing rice its color should be carefully examined, as old-milled rice is of a yellow appearance, while fresh-milled is of a clean and white appearance. By comparing samples of old-milled rice and fresh-milled rice, holding them close to each other, one will soon become accustomed to their appearance and will be able to distinguish the one from the other. Mustiness is detected by the smell.

Rice should be stored in a cool, dry place. The greatest dangers to it are weevils and moisture.

SALMON, CANNED.

The salmon is a fish having flesh generally of a yellowish-red color, and belongs to the genus *Salmo*. It frequents the waters of the North Temperate and Arctic Zones. The chief supply now comes from the Pacific Coast of North America. They are caught in the Sacramento River and in nearly every river which is tributary to the Pacific Ocean north thereof, as they ascend for the purpose of spawning.

There are only five species of salmon, but owing to changes in appearance at different seasons and in different localities it has been erroneously supposed that there were as many as twelve. The most highly prized of all is the Chinook (*S. chouicha*) of the Columbia River. This species, which has flesh of a beautiful pink color, is caught in many other places, but none of them are equal to those caught at the mouth of the Columbia River. They average about 22 pounds in weight, with a maximum weight of from 65 to 70 pounds. The blueback is prized on account of the bright-red color of its flesh. It is much smaller than the Chinook. The white (*S. kisutch*) or silversides is of a fine flavor, but its flesh is of a poor color. These three species are called by different names in different localities, viz: In Alaska, "King," "Blood-red," and "Silver," respectively, and on Puget Sound, "Tyee," "Sock-eye,"

and "Silver," respectively. The other two species are not known to commerce.

The canning season varies decidedly according to locality; on the Columbia River it is from April 10 to August 10; in Alaska, from April to August, and, in certain streams between these two points and south of the Columbia River, from September to January.

In all cases as salmon advance up the streams they deteriorate in quality—possibly on account of the fresh water, lack or change of food, the labor of ascending the streams, or other causes incident to the breeding season.

They are caught mostly by the canners in gill nets, salmon wheels, seines, pound nets, and dip nets, and by the inhabitants with spears and hooks and in baskets as they fall back from the crests of the falls.

The first attempt at canning salmon on the Pacific Coast was made on the Sacramento River, in 1864; the next on the Columbia River, in 1866; the latter stream, since that time, has furnished about 10,000,000 cases.

The salmon-canning industry has only been established ten years in Alaska, yet, at this time, more than one-third of the salmon from the Pacific Coast are caught in Alaskan waters.

Some salmon are cured in barrels with salt, and a few are smoked, but the bulk are packed in 1-pound and 2-pound cans, forty-eight cans of the former size and twenty-four of the latter to the case.

Professors Jordan and Gilbert describe the process of canning salmon as follows, viz:

"The salmon are brought to the wharf, usually in the morning, counted, and thrown in a heap. A man then takes the fish in succession, cuts off their heads, tails, and fins, removes their viscera, and throws them into a large tub. Some of the cutters become very expert and will clean 1,700 fish per day. Next the fish are washed and sometimes scraped with a knife, though the scales are not removed. Then they are placed in a trough in which are several knives acting like a feed cutter, cutting the salmon into sections as long as the height of the can. These sections are set on end and split into about three pieces, one large enough to fill a can, the others

smaller. These fragments are placed on tables and men fit them into cans. Other men put on the tops, and still others solder them. In some canneries the soldering is done by machinery. In this case the cans are rolled along by an iron chain belt and the top end rolls around in melted solder. Most of the canners think the hand-soldering safer, although much more labor is required. After soldering, the cans are placed in hot water and carefully watched to see if any bubbles rise from them, indicating a leak in the can. If perfect, the can is placed in an iron tank and boiled in salt water—it being possible to raise salt water to a higher temperature than fresh. After being boiled about one and one-fourth hours, the can is taken out and vented by puncturing the top of the can—the pressure within driving out all the air through the aperture made. The hole is immediately soldered up. and the cooking completed by again boiling the can for one and one-half hours, in the processing tank, in salt water. If the process of cooking were completed before the cans were vented, the pressure would be sufficient to burst the cans. The cans are afterwards tested by tapping on the head. If the can is leaky, it gives back a "tinny" sound which is easily recognized. This is a very important matter, as some canneries lose largely by careless testing—the leaky cans afterwards bursting and damaging more or less the contents of an entire case. The cans are usually tested three or four times, and by different workmen. A leaky can is simply sent back to be resoldered and reprocessed. The cans are all made on the premises from sheet tin imported for the purpose. The cost of the tin can is estimated at one-ninth of the cost of the can of salmon. On an average, three salmons fill one case of forty-eight 1-pound cans."

The best canned salmon is firm, rich, and oily, and has a bright yellowish-red color, and the superiority in quality can be detected by appearance, touch, and taste.

Swelled or bulged head cans, known as "swells," are spoiled cans, and while they do not detract from the other cans in the case, nor justify their condemnation, no lot containing them should be purchased.

Salmon should be stored in a cool, dry place.

SALT.

The salt of commerce is a slightly impure sodium chloride. The impurities differ in the salt obtained from different sources, both in kind and amount; those most commonly found being calcium and magnesium chlorides, and calcium, magnesium, and sodium sulphates.

Salt is very widely and abundantly distributed geographically. It is obtained by evaporation from sea water and other natural brines, and by mining from natural beds. Deposits of salt in beds, in connection with other geologic formations, are quite common. Salt found in this condition is called rock salt. The beds are presumed to have been formed by portions of the sea having been cut off from the main body and the water thereof evaporating and depositing its entire saline constituents. Rock salt is usually found in large cubical crystals, and, in some cases, in such a state of purity as to be fitted for use. More commonly, however, it is contaminated with impurities, various coloring matters frequently being present, which give it a blue, red, or yellow color. In such cases it is usual to dissolve the salt in the mine, by flowing in water, which is afterwards pumped out in the form of brine and submitted to the evaporating procees. Rock salt is the source of supply of most of the salt of Russia, England, and many other countries; and there are large deposits of it in Louisiana, the principal one being on what is known as Avery's or Petite Anse Island, on the coast of that State.

Sea water contains about 3 per cent of sodium chloride and 1 per cent of other mineral matters, the most important of which are magnesium chloride and sodium, magnesium, and calcium sulphates. So weak and impure a brine can not be profitably evaporated by artificial heat, but by allowing it to flow into shallow reservoirs which, when filled, are shut off from the sea, it can be evaporated by the sun's heat, and large amounts of salt are thus produced very economically. Turk's Island salt is an example of salt produced in this manner. Sea water is the chief source of supply of salt in France, Spain, Portugal, Italy, Central America, and South America. In the United States, natural brines are found abundantly at Syracuse and Onondaga, in New York; in the

Saginaw Valley, in Michigan; at Saltville, in Virginia, and other places. These brines are undoubtedly produced by subterranean water coming in contact with rock salt *in situ*, and dissolving it. In some localities the brine flows from the earth in the form of natural springs, while in others there are subterranean reservoirs which are tapped by boring artesian wells. Salt Lake, in Utah, is a great surface reservoir of strong, natural brine, from which salt is produced as an article of commerce.

Commercially speaking, there are three kinds of salt, viz, coarse, fine, and dairy. Coarse salt and fine salt differ only in the size of their crystals. Dairy salt differs from both of the others in being free from impurities and having smaller crystals.

TO MAKE COARSE SALT.—To make coarse salt, solar heat only can be employed in the evaporating process, it being a natural law that, in a solution of any crystallizable substance, the more slowly the crystals are formed and the more entirely at rest is the solution, the larger will be the crystals formed. The evaporation is conducted in wooden vats supplied with wooden covers for excluding rain and lessening the cooling of the brine at night. In order the more effectually to remove the impurities from the brine, which consist principally of calcium sulphate, calcium and magnesium chlorides, and ferrous carbonate, several vats arranged in a series are used, and the brine drawn successively from one into another. It is allowed to stand in the first vat until the ferrous carbonate is decomposed into carbonic acid and ferrous hydroxide—the former escaping in the form of a gas and the latter settling to the bottom of the vat as a bulky, brown semi-solid. The brine is then drawn off into another vat, where it is allowed to remain until the crystals of salt begin to form in it, when it is drawn off into another vat. During the time it is in the second vat a considerable amount of calcium sulphate is precipitated, and this is left behind when the brine is drawn off. After drawing off the brine from the second into the third vat, the process of evaporation goes on, and the salt forms in large crystals, which are removed from time to time, until the density of the mother liquor is reduced to about 30°

Baumé, when it is discharged. The crystals, when taken from the brine, are washed and put into the perforated top of the vat to drain. The drained crystals are the "coarse salt" of commerce.

TO MAKE FINE SALT.—To make fine salt, *i. e.*, ordinary salt, artificial heat is employed. The evaporation is conducted in large iron pans or iron kettles, heated by steam or over a furnace. Cast-iron kettles, holding about 140 gallons, are generally used. Fifty or sixty of these are set in a double row along two flues, 6 or 8 feet apart, provided with separate furnaces, but having a single chimney. The kettles nearest the furnaces are protected from receiving too much heat, while, by means of a high chimney, assisted by mechanical blowers, a strong draft is created which carries the heat to the kettles farthest away from the furnaces. To remove impurities, a sheet-iron false bottom provided with a bail is placed in each kettle before the brine is put into it. As soon as the evaporation has proceeded so far that salt crystals are beginning to form, the false bottoms are carefully lifted out of the kettles, together with the calcium sulphate (gypsum) and other impurities which have been precipitated upon them. When, as the evaporation continues, a sufficient quantity of salt has been crystallized, it is well stirred for the purpose of washing it in the remaining liquor, and it is then removed from the kettles and placed in baskets, which are suspended over the kettles to drain. After draining several hours, the salt is removed to the "stove rooms," *i. e.*, the drying rooms, where it is allowed to remain two or three weeks, or until it is dry. This dried salt is the "fine salt" of commerce, and is ready to be barreled or sacked and sent to market.

The quality of salt, whether coarse or fine, depends upon its relative freedom from impurities, and also upon their character. Calcium sulphate, which is usually present in larger proportion than any other impurity, is much less objectionable than the calcium and magnesium chlorides or the magnesium sulphate. These latter are present in considerably larger proportions in the brines of Michigan than those of New York, which accounts for the superior quality of the dairy salt of the latter State.

To Make Dairy Salt.—Dairy salt should be entirely free from calcium and magnesium chlorides and magnesium sulphate, which have a bitter taste. It is usually made by selecting extra pure salt, either coarse or fine; carefully washing it; grinding it to a fine powder, to facilitate its solution in water; dissolving it in water; and subjecting the resulting brine to the artificial-heat evaporating process.

Dairy salt should be fine-grained, white, and dry, and without bitter taste.

Uses of Salt.—Salt appears to be essential to the life of man and of the higher animals, and is the only solid mineral substance that is purposely added to and consumed as human or animal food. It undergoes certain useful changes in the animal body, and is not eaten merely to be excreted. Its chlorine helps to furnish the hydrochloric acid of the gastric juice, and the potassium chloride found in the red blood corpuscles and in the muscles. Its sodium forms part of the sodium salts, which are the characteristic constituents of bile, and of the sodium phosphate of the blood. It is a very powerful antiputrefactive, and is therefore used as the principal preservative of animal foods.

Coarse salt is used chiefly in packing pork and beef; fine salt for curing other meats, and as food for domestic animals; and dairy salt for preserving butter, and as food for man. The common grades of salt are largely used in the manufacture of sodium carbonate, to be, in turn, used in the manufacture of soap and glass. Hydrochloric or muriatic acid, which is extensively used in the arts, and chlorine, which is largely used in bleacheries, are made by decomposing salt.

The common grades of salt are put up for the trade in bags and barrels, and the finer grades in packets or small boxes.

Salt for Army use is purchased in the original packages.

SARDINES.

The sardine is a small fish of the genus *Clupea*, to which the herring also belongs. It is caught in the Mediterranean Sea, near the Island of Sardinia, after which it is named. It is also caught off the coast of Brittany. Great attention has been given to, and great perfection achieved in, the packing

of sardines in France, whence come the best sardines; and it may be stated as an important fact with respect to sardines, that excellency of quality is a *sine qua non.*

The sardine packing season opens in May and closes in September or October. The fish are caught with drift seines, and promptly carried to the canneries by boats. At the canneries they are carefully picked over and all "soft," *i. e.*, unsound fish, rejected. They are then graded according to size, and prepared by being dressed, salted, partly dried, and then scalded in hot olive oil, put into tin boxes with hot, salted olive oil or hot, salted olive oil and butter, and hermetically sealed. The tin boxes are of three sizes, viz, "wholes," "halves," and "quarters." The whole boxes are 5 inches long, 4 inches wide, and 3½ inches deep; the half boxes are 5 inches long, 4 inches wide, and 1⅝ inches deep; and the quarter boxes are 4¾ inches long, 3½ inches wide, and 1¼ inches deep.

Sardines are put up in cases containing 50 whole boxes, 100 half boxes, and 100 quarter boxes, respectively.

After being packed, sardines improve with age for probably two years or more, and should not be used under four months.

They should be stored in a dry place to prevent the rusting of the tin boxes. No especial care is necessary in repacking them for shipment, but sawdust is often put in the cases between the boxes to prevent them from being indented by rough handling.

For Army use, half boxes and quarter boxes are purchased.

SAUCE, WORCESTERSHIRE.

The genuine Worcestershire Sauce is made by Lea & Perrins, chemists, Worcester, England.

The words "Worcestershire Sauce" are used upon an indefinite number of table sauces, but the name "Lea & Perrins," being copyrighted in this country, can not be used as a part of a label for Worcestershire Sauce without an infringement of law.

Persons accustomed to the use of the genuine Worcestershire Sauce readily detect imitations by their lack of proper flavor and bouquet.

It is put up for the trade in half-pint bottles, in cases containing thirty-six and one hundred and twenty bottles, respectively; and in pint bottles, in cases containing twenty-four and sixty bottles, respectively.

For Army use, half-pint bottles only are purchased.

SHRIMPS, CANNED.

Canned shrimps are prepared from small, long-tailed decapod crustaceans belonging to the genus *Crangon*, having a delicately flavored flesh of a pretty reddish color when cooked.

For canning, shrimp should be fresh, and, therefore, should be carried to the cannery as soon as possible after being taken from the water. Upon arrival at the cannery they are cleaned, put on large tables, and stripped of their crusty shells by hand. They are then placed in large wire crates and parboiled, after which they are steamed, cooled, and canned.

As contact of the shrimps with the tin would cause the inside of the cans to corrode and turn black and injure the shrimps, they are protected from contact with the tin by being placed in cotton-cloth bags. This is effected by placing a bag in each can, weighing into it the proper amount of dressed shrimps, closing the bag by carefully folding over the end, and then putting on the top of the can and soldering it.

Cans for packing shrimps are soldered on the outside.

Canned shrimps have very good keeping qualities, but they do not improve with increase of age. It is, therefore, not advisable to accumulate a greater supply of them than is sufficient to last until the next pack comes into the market.

For shrimps there are two packing seasons in each year, viz, the spring and the fall. The spring packing season opens in March and closes in May, and the fall packing season opens in August and closes in November.

Shrimps are put up in cans of medium size, twenty-four to a case.

SIRUP, CANE.

Cane sirup, called in Louisiana *sirop de batterie*, is the residuum of the process of refining raw cane sugar.

As cane sirup contains a greater or less proportion of crystallizable sugar, it will, in the course of time, deposit more or less crystallized sugar in the receptacles containing it.

Cane sirup is frequently adulterated with glucose. Glucose, as heretofore explained in the article on "Sugar," is deficient in sweetness. It is, however, of a glycerin-like clearness and consistency. Its effect, therefore, as an adulterant of cane sirup, is to reduce sweetness and improve appearance. Cane sirup and molasses, adulterated with glucose, flavoring extracts, etc., are put upon the market under the name of "golden sirup." The agitation of cane sirup incident to its removal from one place to another, in warm weather, and particularly that incident to its transportation over considerable distances, is liable to throw it into a state of internal commotion of greater or less violence, accompanied by expansion in volume and a tendency to ebullition; and whenever a lot is received in this condition it should be stored in a cool cellar and the bungs taken out of the barrels. When it is thus stored for a few days it generally becomes quiet without sustaining injury.

A ready and excellent method of determining the quality of a sample of cane sirup is to put about a teaspoonful of it into a porcelain dish, and a large pinch of bicarbonate of soda; blend them rapidly with the finger; the better the sirup the lighter will be the color of the blend and the more rapidly it will rise. Much glucose in the sample has the effect of making it heavy and become darker under this process.

Everything else being equal, the cane sirup that has the greatest density is the best. To ascertain the density, use a Baumé hydrometer.

New-crop cane sirup comes into market about the middle of November.

Cane sirup readily ferments, and therefore should not be shipped in warm weather, and should be stored in a cool place.

Cane sirup is put up in 1-gallon cans, four or six to the case, and 10-gallon kegs, containing 8 gallons.

An "outage" or vacant space of not less than 20 per cent of their capacity should be left in all receptacles containing cane sirup, to permit of its expansion.

If overboiled in contact with the air, sucrose changes in character, and, especially if an acid is present, becomes changed into what is called invert sugar.

This invert sugar can be separated into two kinds—dextrose, a crystallized fiber sugar, and a non-crystallized sugar called levulose or fruit sugar both chemically identical with glucose. Sirups containing invert sugar are most apt to ferment, alcohol, and then carbonic acid, being formed. This fermentation, with the evolution of carbonic acid, accounts for the occasional finding of swelled cans of sirup in a lot, as overheating while in store or during transportation has the same effect as overboiling in the process of manufacture.

SOAP, LAUNDRY.

Laundry soap is a composition of fatty acids, alkali, and water, the acids being fats and oils of all kinds, and the alkali, soda. Sometimes resin is added to increase the weight and cheapen the cost of production. Soap containing resin in excess dissolves in water too rapidly and is strongly caustic and relatively soft, and these characteristics appear to be more pronounced when the fatty acids used are oils instead of fats. The proportion of alkali is from 6 to 8 per cent; the proportion of acids, from 40 to 63 per cent; and the remainder is water. The greater the proportion of alkali, provided it is chemically combined with the fatty acid, the better the soap. Alkali not chemically combined with the fatty-acid ingredient of soap is simply an admixture of free alkali. Such soap is too "sharp" and injures the laundried fabrics.

The fatty materials used in making laundry soap are as follows, viz:

1. *Tallow.*—Tallow ranks foremost among the fats used in soap making. Alone, it does not, however, make a soap adapted for hot climates, as in such climates tallow soap becomes so hard that it is almost useless.

2. *Grease.*—The term "grease," as used commercially, comprises various fatty matters of animal origin, and is extracted from bones, hides, the refuse of kitchens, and from those parts of all animals which do not yield fat that might be classed as tallow or lard.

3. *Cotton-seed Oil.*

4. *Palm Oil.*

5. *Cocoanut Oil.*—Cocoanut oil is used in the manufacture of "padded" or "filled" soaps. When used with tallow and

resin, it will take up, in saponification, large quantities of water, water glass, and similar fillings. A soap known to contain cocoanut oil should not be purchased for the Army, as it probably has in it a large excess (70 or 80 per cent) of water.

6. *Red oil.*—When tallow is used in manufacturing glycerin and stearic acid for commercial purposes, oleic acid, known commercially as "red oil," is produced as a residuum, and is used quite extensively as a material for making laundry soap. According as the fat has been decomposed by distillation, or by treating it with lime and a current of steam, the oleic acid is known as "distilled" or "saponified." The distilled red oil is thinner than the saponified, and is contaminated with the by-products of the process. The saponified is, therefore, the better material of the two.

Before using red oil for making laundry soap, it is frequently first treated with nitrous acid, which changes it into a substance as hard as tallow, and from which a very fine soap, resembling tallow soap, can be made.

The alkali material is usually soda.

If, after a soap is "made," the lye in which it is suspended is concentrated to a point short of that necessary to produce hard curd soap, and it is then transferred to the cooling frames with a certain quantity of lye entangled in it, these insoluble particles will, during the solidification of the soap, collect together and produce the peculiar appearance known as "mottled."

Red oil is largely used in the manufacture of the well-known "German mottled" bar soap. This is a "boiled down" soap, and therefore harder and less wasteful than the ordinary soap made from the same stock.

When in the process of making soap the saponification is complete, the mass is drawn off from the boiler into the "crutcher" and allowed to settle. In the process of settling, the residuum, called from its black color "nigre," and which constitutes from 20 to 25 per cent of the boiled mass, falls to the bottom and is drawn off and generally thrown away, as it is not profitable to extract the glycerin therefrom.

"Floating" soap is made by beating the semifluid, saponified mass while in the crutcher, until sufficient air is intermingled therewith to reduce the specific gravity of the soap cut therefrom, when it hardens, to less than 1°.

Laundry soap is usually cut into short-weight 1-pound bars and packed in boxes containing from forty to one hundred bars each.

Laundry soap improves with age, and no especial care is necessary in its storage or transportation.

Good soap is firm, resists the pressure of the thumb, and, when rubbed with the fingers, has a smooth feeling. Pasty consistency and streakiness of color indicate the presence of free alkali; and a lightish color, smooth surface, and smooth appearance indicate less free alkali, less resin, and a better chemical combination. Usually the relative proportions of water contained in different samples can be determined by handling them, but if accuracy is required, they may be determined as follows, viz:

Cut a bar of the sample of soap in two, take some shavings from the fresh surface, put them in a weighed porcelain dish and weigh them; note the weight of the dish and the soap; dry first at 122° F. and finally at about 230° F. until constant; reweigh dish and dried shavings, deduct weight of dish, and calculate according to the following formula, viz:

Porcelain dish and sample	47.6
Porcelain dish	42.8
Soap taken	4.8
Porcelain dish and soap	47.6
Porcelain dish and dried soap	46.1
	1.5

$$\frac{1.5}{4.8} = 31.25 \text{ per cent.}$$

The fatty acids may be determined as follows, viz:

Cut a bar of the sample soap in two; take some shavings from a freshly cut surface; weigh the shavings into a beaker; add water; boil until soap is dissolved; add solution of sulphuric acid in excess, and the soda will then be precipitated as a sulphate and the fatty acid will float on top; add a weighed amount of paraffin and a cake will form; then dry

with blotting paper; weigh, subtract the weight of the paraffin, and divide by the total weight of soap used, as shown in the following formula, viz:

Soap used	5
Paraffin	8
Weight of cake after drying	11
Deduct paraffin	8
Fatty acid	3

$$\frac{3}{5} = 60 \text{ per cent fatty acid.}$$

The determination of the fatty acid in soap is the analyst's work.

To determine whether a sample of soap contains a free alkali or not, drop an alcoholic solution of phenolphthalein on a freshly cut surface of the soap. If the sample contains free alkali, a red color will be produced, the intensity of which will be in proportion to the amount of the alkali present.

It is impossible to determine the exact composition of soap, and consequently its value, otherwise than by analysis. For many purposes it is sufficient to ascertain the proportions of water, fatty acids, and alkali, while for others a full analysis is desirable.

The main points to be considered in the selection of soap are the following: 1st, the nature of the fatty ingredients, and whether they are pure, clean, and unobjectionable; 2d, the amount of water; 3d, the amount of resin; 4th, the amount of free alkali.

SOAPS, TOILET.

Toilet soaps should be made of fine materials, with great care. They are sometimes scented or perfumed, and also colored or medicated.

The fats used as materials in making toilet soaps are tallow and lard, and olive, palm, and cocoanut oils. Cotton-seed oil is not suitable for use as a material for making toilet soaps, for the reason that soaps made therefrom are liable to become rancid and discolored. The alkalies used are soda and potash, but generally soda.

Toilet soaps are classified as follows, with respect to their mode of manufacture or the materials of which they are made, or both, viz:

1. Cold-process toilet soaps.
2. Boiled toilet soaps.
3. Transparent toilet soaps.

Cold-process toilet soaps are the poorest in quality, because they retain whatever impurities there were in the ingredients, and because, in order to insure complete saponification of the fatty-acid ingredient and thereby prevent rancidity, it is necessary to use an excess of the alkali ingredient, which, remaining in the soap as an admixture, is injurious to the skin of the user, although it be disguised by the glycerin, all of which is retained by the soap. Cocoanut oil is the sole or chief fatty acid used in making cold-process toilet soaps, because it is readily saponifiable at low temperature, and because soda soap made therefrom is very hard, even when it contains as much as 75 per cent of water. The better grades of cold-process toilet soaps are made from a mixture of fats consisting of a large proportion of cocoanut oil and a small proportion of tallow or lard, and a mixture of alkalies consisting of a large proportion of potash. Cold-process toilet soap of good quality is almost transparent at the edges of the cakes and does not taste of alkali.

The materials used in making transparent toilet soap are tallow, cocoanut oil, castor oil, stearin, alcohol of from 90 to 95 per cent proof, glycerin, sugar, and water.

The quality of transparency which characterizes these soaps, and to which they owe their beauty, is due solely to their alcohol ingredient, and is not, therefore, indicative of purity or value. Transparent toilet soaps containing glycerin owe their special value to the fact that they lather rather freely, and have a beneficial effect upon the skin of the user.

Nearly all shaving soaps contain cocoanut oil, while the alkali ingredient is a mixture of from one-half to two-thirds soda, and the balance potash. The potash renders the soaps softer and more readily soluble in water than if the alkali ingredient were soda alone. Shaving soaps are not salted out, but are made like cold-process soaps or transparent soaps.

In the manufacture of boiled toilet soaps, which are the best, "stock soaps," *i. e.*, bulk soaps to be worked over and transformed into finished toilet soaps, are first made. The manufacture of stock soaps is divided into four operations, as follows, viz:

1. Saponification or "killing the stock" and "boiling smooth."
2. "Breaking the soap" or "salting out."
3. Boiling the soap upon strong lye or "graining."
4. "Pitching" and "drawing off the nigre."

Having prepared the various stock soaps, the next step is to convert them into finished toilet soaps, which consists of six operations, as follows, viz:

1. "Cutting" or "shaving."
2. "Milling the shavings," in order to thoroughly mix them with the perfume, coloring matter, or medicine, if used.
3. "Plodding" or pressing the milled soap into bars of the desired form.
4. Cutting the bars into cakes.
5. "Warming" or drying the cakes.
6. Pressing the cakes between dies.

Toilet soaps are generally packed for the trade in cartons containing three cakes each, twelve or twenty-four cartons to the case.

SOUPS, CANNED.

The bases for most soups are "soup stocks."

TO MAKE BEEF SOUP STOCK.—Pieces of lean beef, cut into convenient sizes, are put into a galvanized-iron tank and boiled until the juice is extracted therefrom; the tissues and foreign matter rise to the top and are skimmed off; and the remaining liquid is drawn off into another tank, where it is boiled down to the consistency required for making the particular kind of soup desired.

CHICKEN SOUP.—Chicken soup is made from beef soup stock, to which, after being drawn off into copper kettles, chopped chicken, rice, chopped vegetables, and seasoning are added. The whole is then brought to the boiling point; it is then drawn off into cans, sealed up, and processed. The cans are

then labeled and packed into cases. If the boiling is continued too long, the meat and vegetables will be disintegrated and become tasteless. Canned soups should not be highly seasoned, as seasoning is a matter of taste and can better be regulated when the soup is served.

MOCK-TURTLE SOUP.—Mock-turtle soup is made from calves'-head soup stock, which is made as described for beef soup stock, except that calves' head, instead of beef, is used; it is then drawn off into copper kettles and pieces of calves' head and veal and the seasoning added, and the whole brought to the boiling point and then canned, as described for chicken soup.

OX-TAIL SOUP.—Ox-tail soup is made from ox-tail soup stock, as its name indicates. Ox tail soup stock is made as described for beef soup stock, except that ox tail is used instead of beef, and when boiled down to a proper consistency is drawn off into a copper kettle, where pieces of ox tail, vegetables, and seasoning are added, and the whole brought to the boiling point. Ox-tail soup in which is found pieces of bone perfectly bare, or meat in shreds or covered with white specks, is not desirable, because the ox tail from which the soup stock was made was not fresh, or because it was not made from ox-tail soup stock but from beef soup stock, and that the added pieces of ox tail were cooked to pieces in order to give the soup a more decided ox-tail flavor.

BEEF SOUP.—Beef soup is made from beef soup stock, as described for chicken soup, small pieces of beef being added, instead of chicken, to the stock in the mixing kettle.

Beef soup stock is generally preferred to ox-tail soup stock, for the following reasons, viz: It keeps better, owing to the fact that it is free from the pieces of bone that are found in ox-tail soup stock; it is less expensive, requires less care and skill in manufacture, is more wholesome, has a better flavor, and is also apt to be more cleanly prepared, owing to the fact that the ox tails are cut off at an early stage of the dressing, and generally do not receive the attention that the rest of the beef does.

To inspect samples of canned soup the cans are opened and their contents tested for odor and flavor at once, before they

are dissipated; the contents are then poured out and the condition of both the liquid and solid portions examined. If the liquid portion is very greasy, it indicates that the soup stock was not carefully skimmed. The solid portion or meat should be firm and have a fresh taste or odor; and if it is mushy or shreddy, it indicates that the soup has been cooked too long, or that disintegration, from age, has set in.

The spoiling of the contents of a can from any cause, will, in time, cause the swelling of the can, and care should be exercised so as not to receive "swells" or leaky cans on contracts. The quart can is a commercial size, and is convenient for Army use.

Canned soups should be kept in a uniformly cool place.

SOUPS, COMPRESSED.

COMPRESSED SOUPS.—Various products are in the market under this general term. The necessary ingredients to form a stock for the character of soup intended are first desiccated and then compressed by great pressure into tablets or cylinders of about 4 ounces each, from which, by the addition of water and by following the directions accompanying the package, a nutritious and palatable soup may be readily produced with little trouble.

The tablets are generally covered with tin foil or parchment paper for protection from moisture.

Almost all kinds of vegetables are used in the manufacture of soups. Those most generally used by troops are made from pea meal or bean meal.

Each manufacturer has a different formula. Some add extract of beef, others shredded beef or fat, etc., with such seasoning as they may deen necessary.

The famous "Erbswurst" used by the German Army was made in the following proportions:

	Lbs.
Peas, ground	60
Fat	14½
Salt	4
Pepper, black	½
Mint	½

The ingredients should be of the very best quality, perfectly fresh, carefully selected, and great care should be taken in their mixture. They should, with ordinary care, last for at least two years.

The preserving of the vegetable is a very simple matter. The vegetables to be preserved should be well grown, but not hard or stringy; only really good vegetables should be used.

From information obtained in regard to preserving vegetables it is found that 2,425 pounds of fresh vegetables yield 199 pounds and 12 ounces dried vegetables, or about $\frac{1}{12}$.

From more extended experiments it is found that 4,000 pounds fresh vegetables yield 320 pounds dried vegetables, or rather over $\frac{1}{12}$.

Therefore it is safe to estimate that twelve pounds of fresh vegetables will produce one pound of dried vegetables, three and a half to four ounces of which will give one pound when cooked, and are thus the equivalent of the ration of fresh vegetables.

STARCH.

Starch is a granulated substance of organic origin which, when dry, has the appearance of a white, glistening powder, without marked taste or smell, and which gives a peculiar sound when rubbed between the fingers. It is composed, by weight, of six parts of carbon and ten parts of hydrogen, and belongs to that important group of carbon compounds known as *Carbohydrates*, to which also belong sucrose or cane sugar, glucose or grape sugar, cellulose or woody fiber, and dextrin or gum. It is found everywhere in the vegetable kingdom in large quantities, and particularly in all kinds of grain, as maize or Indian corn, wheat, etc.; in tubers, as potatoes, arrowroot, etc.; and in fruits, as chestnuts, acorns, etc.

In this country starch is made chiefly from maize or Indian corn, which is abundant and cheap; and in Europe, from potatoes.

Starch is used as a food and also in the arts as a material for making stiffening for cloth.

Starch destined for use as food is, in this country, always made from Indian corn, by the sweet process, and is called "Cornstarch," in contradistinction to starch destined for use

in the arts, which is called "Laundry Starch," which may be made of other materials than Indian corn and by other processes than the sweet process.

To Make Cornstarch.—Yellow Indian corn is generally used as the material for making cornstarch, and, as above stated, this kind of starch is always made by the sweet process. The corn is ground into fine meal, which is run into deep vats, with plenty of pure water, and kept stirred by revolving rakes. The stirring is constantly kept up for from nine to ten days, so as to remove all foreign matter. After this extensive washing of the fine meal, the resulting starch is allowed to settle into molds, and when dry enough is ground very fine and put up in 1-pound papers, and is usually packed in cases containing forty 1-pound papers.

To Make Laundry Starch.—Laundry starch is manufactured by two processes, one of which is known as the sour or fermentation process, and the other as the sweet process. In the sour process, yellow Indian corn is the material generally used. It is ground into fine meal, then run into a mash tub and allowed to ferment into a sour mash; from the mash tub it is pumped to the bleaching floor, where it is thoroughly washed and cleaned from gluten and all impurities. The fluid containing the starch in suspension is allowed to run into long troughs with perforated bottoms and the water drained off, leaving the starch in the boxes or molds. As soon as the starch is dry enough to handle, it is cut into cubes and taken to the drying kiln, where all of the rest of the water is driven off. The cubes are broken up and packed, either in bulk in boxes or in 1-pound packages, forty 1-pound packages to the case.

In the sweet process the mash is not allowed to ferment, but is run into deep vats, with plenty of pure water, and kept stirred by revolving rakes during the day, for five or six days, and allowed to settle at night; the scum of impurities that rises to the top during the night is removed in the morning. After this extended washing of the mash, the resulting starch is settled in molds and dried, as in the sour process.

The greater part of the laundry starch produced is made by the sweet process. In can easily be distinguished from the sour-process starch, which has a sour smell and sometimes a sour taste.

Laundry starch is also made by what is called the chemical process. The corn, before being crushed, is treated with a solution of caustic soda or hydrochloric acid until the gluten is dissolved out, after which it is crushed, washed, and dried in much the same manner as in the other processes.

It is packed in bulk in boxes containing forty pounds, or in 1-pound packages, forty 1-pound packages to the case.

SUGAR.

The word sugar is probably of Sanscrit origin. It is used to designate a class of substances possessing a sweet taste, and capable of breaking up into alcohol and carbon dioxide under the influence of ferments, such as yeast.

Of the various kinds of sugar known to chemists, only two are of importance to domestic economy, viz, cane sugar or sucrose and grape sugar or glucose.

Cane sugar is so called because it is obtained principally from the juice of the sugar cane or *Saccharum officinarum*, a plant of the order *Gramineæ* or grass family.

The sugar-cane plant is probably a native of Southeastern Asia, but it is not known to grow anywhere now in the wild state. It is cultivated very generally in all tropical and sub-tropical countries. It grows best, however, where the average temperature is from 75° to 85° F., but it is grown in much cooler climates, even in those where the average temperature is from 60° to 65° F. It is extensively grown in Louisiana, the West India Islands, Central America, and along the entire coast of Northern South America. It is scarcely grown in Southern Europe, but is grown extensively throughout large portions of Asia and the East India Islands.

Sugar-cane sugar has been known from the earliest historic times, and some early writers speak of it as "honey made from reeds without bees." Although it was known to the ancients, it seems that it was not used by them to any considerable extent, and that, until quite modern times, honey served the people of the world as their only saccharine food.

Sucrose or cane sugar, while most extensively produced from the juice of the sugar cane, is also produced from the juice of the sugar beet (*Beta vulgaris*), the sap of the sugar maple (*Acer saccharinum*), and from the sap of several species of palm. The process of manufacture from these juices or saps is essentially the same in all cases.

Sugar cane is the source of about 40 per cent of the sugar product of the world.

TO MAKE SUGAR FROM SUGAR CANE.—To make sugar from sugar cane, the canes are cut down and trimmed of their leaves and tops and hauled to the mill. The mill consists of three horizontal iron rollers, one being placed above and in close proximity to the other two. The canes are fed to the mill between the upper roll and one of the lower rolls, and from these pass automatically between the upper roll and the other lower roll. The mill is generally run by steam power. Its action is to crush the canes and extract therefrom the juice. The pressed canes are called *bagasse*, and are dried and used for fuel. The juice as it comes from the mill is a yellowish-green liquid, having a specific gravity of from 1.07 to 1.09, and usually contains from 18 to 20 per cent of sugar, together with a small quantity of albumen, fragments of cane, and other impurities. Owing to the presence of impurities, the juice is very liable to ferment if allowed to stand, even for only a few minutes, and to prevent fermentation the juice is at once passed from the mill, through strainers, into iron or copper kettles holding several hundred gallons, where it is heated to a temperature of from 100° to 150° F., when there is added to it a quantity of slaked lime, after which it is brought nearly to the boiling point. The albumen is coagulated by the heat, and rises, with the other impurities, to the surface as a dense scum, which is carefully removed, after which the juice is ready for evaporation.

The purified juice is transferred to vacuum pans and boiled until it is sufficiently concentrated, when it is run off into large open pans to crystallize. The crystals which form from the sirup agglutinate into a solid mass, and are known as raw or muscovado sugar. The residuum or non-crystallized portion

is known as molasses. The old West India or New Orleans molasses, which made such good gingerbread, was of this type and was somewhat acid, owing to the presence of acetic and formic acids.

The separation from the crystallized sugar of the molasses or sirup is now effected by machines called centrifugals, which accomplish in a few minutes what previously took days. A centrifugal, which is essentially a press and a strainer combined, consists of a finely perforated sheet-metal revolving cylinder mounted on a vertical shaft, within a fixed concentric, unperforated sheet-metal drum. The solid raw or muscovado sugar is first cut by a machine into small pieces of uniform size, and in this form is put into the revolving cylinder, and the latter started up and run at a speed of from 1,000 to 2,000 revolutions per minute. The centrifugal force generated in the cut-up raw sugar by its rotation in the revolving cylinder of the centrifugal causes it to rise up from the bottom and form a stratum of uniform thickness on the inside of it, under a very strong pressure, which drives the molasses out through the perforations into the surrounding drum. To complete the process, a very small quantity of water is thrown into the revolving cylinder to wash the sugar. The machine is then stopped and the sugar scraped out.

The raw sugar, after the molasses has been extracted, is sent to the refineries to be made into the different styles of white sugar, viz, loaf, cut loaf, cube, crushed, granulated, and powdered.

To Make Sucrose or Cane Sugar from Beets.—More than one-half (60 per cent) of the sugar made in the world is obtained from the sugar beet (*Beta vulgaris*), of which there are several varieties cultivated, the more important being the Silesian, the French Vilmorin, the Siberian, and the Imperial. Sugar beets sometimes contain as much as 10 or 12 per cent of sucrose or cane sugar. They were first used for the production of sugar about the beginning of the present century. Now, they are the source of nearly all the sugar made in Continental Europe.

The method of making sugar from beets does not differ very greatly from that of making sugar from sugar cane.

The beet roots are first washed in an open revolving cylinder, placed beneath water. The juice is then extracted, several different processes being used for the purpose, the more common being to rasp the beets to a fine pulp in a machine, consisting essentially of a large rotating drum, having its surface thickly set with iron teeth. The rasped pulp is then placed in sacks and the juice expressed by means of a hydraulic press. By this process from 80 to 85 per cent of the weight of the beet is extracted as juice. Good beets contain 96 per cent of juice, of which 12 per cent is cane sugar. The juice is sometimes extracted by centrifugals, and sometimes by repeated washings and maceration in cold water. A process of maceration in cold water, called the "diffusion" process, in which the beets are sliced into thin shavings and exposed to the action of water for several hours, is sometimes also employed. The juice, after extraction, is purified by boiling it with lime; then filtering it through bag and bone-black filters; and afterwards concentrating it to the crystallizing point in vacuum pans. The process of refining raw beet sugar is practically the same as that for refining raw sugar-cane sugar, and the refined product of the former can not be distinguished from the refined product of the latter.

The manufacture of sugar from beets has been tried to some extent in this country, but without any great success, except in Nebraska, California, and Utah. The molasses from beet sugar is mostly used for making whisky, as it has a very unpleasant flavor and is not suitable for food.

MAPLE SUGAR.—In parts of the United States and Canada, sugar is made from the sap of the sugar maple and other allied species. The sugar is sucrose or cane sugar, but accompanying substances in the sap, which are retained in the raw sugar, give it quite a peculiar and agreeable flavor, to which it owes its special value. The refining of maple sugar destroys its maple flavor and converts it into ordinary cane sugar.

SORGHUM.—Chinese sugar grass or sugar millet (*Sorghum saccharatum*), has been cultivated in this country with some success. It seems to be suited to a temperate zone, and is

thus intermediate between the maple and beet of the North and the sugar cane of the South.

GRAPE SUGAR OR GLUCOSE.—Grape sugar, so called from the abundance thereof in that fruit (from 10 to 15 per cent), is found in a great variety of fruits. The sirup may be refined and crystallized, as in the case of cane sugar, but it crystallizes with difficulty, and is apt to absorb moisture and become moist. It is too costly for ordinary use. It is glucose, and all forms of starch can be converted into commercial glucose.

Glucose is one and one-half times less soluble than sucrose, as it requires one and a third times its weight of cold water to dissolve it. It requires two and a half times more grape than cane sugar to sweeten a given volume of water to the same degree; hence, while grape sugar (glucose) is nominally cheaper than cane sugar (sucrose), it is not as valuable, pound for pound, as a sweetener.

Glucose as it is usually sold contains about 20 per cent of water and about 20 per cent of unfermented substances, leaving only 60 per cent of sugar—the sugar, however, sometimes runs as high as 75 per cent.

The process of making glucose or grape sugar from starch consists (1) in separating the starch from the corn by soaking, grinding, straining, and settling; and (2) in converting the starch into sugar by the action of dilute sulphuric acid, this acid subsequently being removed by the action of chalk. To make solid grape sugar, the conversion is carried further than it is in making liquid glucose. After clarifying, the liquid is concentrated in vacuum pans, and is decolorized with bone black.

All woody fiber or cellulose can be so acted upon by certain acids as to form glucose; hence sawdust, cotton, etc., can be converted into glucose, from which originated the stories about old rags, old shirts, etc., being used to make sugar.

Grape sugar represents one of the two principal classes of commercial sugar and cane sugar the other, the former being obtained naturally from the grape and the latter from the cane and the beet. Grape sugar, which is a term chemically synonymous with dextrose and glucose, has about two-thirds

the sweetening power of cane sugar or sucrose. When treated with dilute acids, both cane sugar and starch yield dextrose. In the case of starch, however, dextrose constitutes the sole final product.

ADULTERATION.—Under the direction of the Department of Agriculture, the chief chemist of that Department has made searching investigations into the manipulations and adulterations of sugar. In his report for 1892 he says:

"The total absence of any added matters to the sugars of commerce is plainly shown by the five hundred analyses of samples purchased in open market in different parts of the country. The low price of cane sugar, however, has heretofore prevented the profitable adulteration of cane sugar with any article made from starch or terra alba, at least in so far as the limited examination of them extended. The chief adulterant of low-grade sugars, if it can properly be so called, is water. The question of the use of these sugars is one of economy only, for they are certainly not injurious to health. Such sugar cakes on standing long. White and yellow sugars usually receive a special treatment, either in the vacuum pan or the centrifugal, in order to prevent a gray, 'dead' appearance. In the case of white sugar ultramarine blue is the substance usually employed for this purpose."

It is not unusual to find sugars which have been excessively blued and which, when dissolved, make a blue sirup. Fortunately, ultramarine is not poisonous and no injury to health can result from its use.

The yellow clarified sugar of the plantation is always treated with a wash containing chloride of tin, commercially known as "tin crystals." Those not so treated soon after leaving the centrifugal lose their bright color. Such sugars are only manufactured for refinement and are not sold to consumers.

Foreign matters being insoluble in water, tests therefor are simple, *e. g.*, if ½ pound of sugar is dissolved in a pint of water, a sediment will be deposited by the solution if marble dust or sand is present. The skilled analyst uses the polariscope or saccharometer to determine the percentage of pure sugar.

TO REFINE RAW SUGAR.—To refine raw sugar it is first dissolved in water and the solution boiled with white of egg or serum of blood, to purify it. Formerly chemicals, such as the salts of tin, were sometimes used, but metallic salts are not now employed for this purpose. The boiling separates all the gum, albumen, etc., from the solution, and, after filtering, it is clear. It is finally filtered through bone black to remove the coloring matter. The solution is then conveyed to vacuum pans, where, at a temperature of from 130° to 150° F., it is evaporated until it is concentrated to such a degree that, when removed and cooled, it will at once crystallize into solid sugar. A part of the sugar is rendered non-crystallizable by the heat of this last boiling, and is the residuum of the process. This residuum is called cane sirup (see Sirup, cane).

The concentrated sirup is then drawn from the vacuum pans into the agitators, and thence, when it has partly cooled and become semi-solid sugar, into the molds. The molds are cone-shaped and have small openings at the small ends, which are closed by plugs when the semi-solid sugar is run into them, but when the sugar is cooled and hardened the plugs are withdrawn and the cones are set over iron pots to drain. When the mother liquor, called "first greens," has ceased to run from the molds, the top of the loaf is cut smooth and a quantity of pure solution of sugar, called "white liquor," is poured over it, which washes out the last trace of mother liquor and leaves the loaf perfectly white. When it has entirely ceased to drain the loaf is removed from the mold and the damp tip broken off. The subsequent treatment depends upon the condition in which it is to be marketed. If it is to be marketed as loaf sugar the loaves are first placed in rubber sockets connected with an air pump and exhausted of the remaining liquid, and then placed in lathes and turned smooth, when they are ready for market.

For the production of "A" sugar the loaves, while still moist, are placed in cutting machines and shaved fine. This shaved sugar is sometimes carefully dried and sifted; the portion separated by sifting is powdered sugar, and the portion remaining is sieve granulated. The loaves are, at other times, dried in hot-air chambers and then broken in crushing

machines, and the product separated by sieves into coarse crushed sugar and powdered sugar.

The dried loaves are also sometimes cut into cubes by machines, and these are known as cut-loaf sugar.

The mother liquor or first greens, which has drained from the molds, is diluted, "blown up," *i. e.*, boiled, filtered through the bag filters and the bone-black filters, and again concentrated in the vacuum pans. From the vacuum pans it is drawn off into the agitators, from which it may be either put into molds, or into the centrifugals to remove the mother liquor, known as "second greens." The sugar thus obtained is of a light-buff color, and is called "C" sugar.

The second greens are again subjected to purification by filters, evaporated in the vacuum pans, and transferred to the centrifugals. The centrifugals extract the mother liquor, known as "green sirup," and leave a dark-colored sugar, which is sold as "X" or yellow sugar. The green sirup is again diluted, blown up, and filtered, and concentrated to a proper consistency, when it is sold as "golden sirup."

Loaf, "A," and other white sugars contain, when dry, 100 per cent of sucrose; "C," usually from 85 to 87 per cent; and yellow, from 80 to 83 per cent.

The details of the process of refining sugar vary considerably in different refineries; and the quality of the above grades of sugar, as produced by the different refineries, will vary on this account, and, also, on account of the differences in variety of the raw sugar from which they are obtained, and a further gradation of commercial sugar is consequently used. In this country the grades usually named are "Standard A," "Off A," "White Extra C," "Yellow C," "Yellow," and "Brown." The Dutch standards are simply an arbitrary series of numbered raw sugars, selected in Holland, and in general use as standards.

With the improved process of boiling in vacuum pans the old molasses has almost disappeared and sirups have become more costly. Much of the old-time molasses went to the distilleries to be made into rum. The grades of sugar have also changed very much. The dark-brown sugars have almost disappeared from the market. This is owing to the improved

methods of boiling. The granulated sugar is of the same quality as the loaf, cut-loaf, cube, and crushed, and differs from them only in that its crystals do not cohere, because the concentrated sirup is constantly stirred during the process of crystallization. The light-brown sugars are the next product, containing some molasses, and, therefore, they taste sweeter, because the sweet taste is more pronounced in the colored portion of the mother liquor or molasses which they retain.

If granulated sugar is not quite freed from the mother liquor or sirup it has a more decidedly sweet taste than where perfectly pure, *i. e.*, it has more the taste which we are accustomed to associate with sugar.

It is often said that powdered sugar is adulterated, and that it is not as sweet as loaf sugar, but such is not the case, and some explanation must be sought. The reason seems to be twofold: First, a spoonful of powdered sugar, because of its less density, does not weigh as much as a spoonful of granulated; and second, since sweetness is a physical property, the physical condition of fineness of division has something to do with it—the coarser grains seeming to excite in the nerves of taste a stronger vibration, so to speak, in dissolving than do the finer particles.

USES OF SUGAR.—Taking the world as a whole, it might be said that sugar has been used as a condiment rather than as a food, but, in the light of recent statistics, it seems to be a very important article of diet, and it should be so considered. In cold countries sugar seems to be taking the place of oil as a heat-giving food. That it plays the part of a heat-giving food is indicated by the fact that it is not craved to so great an extent in summer as in winter. There seems to be a growing opinion in favor of its moderate use. It is true that, if the stomach is not able to digest it at once, it is liable to change into lactic acid, instead of being absorbed into the system; but this only shows that sugar is not suitable for that stomach at that time. Like the use of all other foods, the use of sugar may be abused. The very general craving for sweets is undoubtedly founded on a natural demand of the system; hence, a moderate use of sugar by children is not to be condemned.

BY-PRODUCTS.—Molasses is the residuum of the process of making raw sugars, while sirup is the residuum of the process of refining them.

The molasses resulting from the manufacture of raw beet sugar and the sirup resulting from the refining of it contain so much alkaline matter as to be unfit for food.

NEW SUGAR.—The sugar of Cuba commences coming into market in September, and that of this country in October. Beet sugar is most largely manufactured in the fall.

PACKING.—The best method of packing sugar, where it is to stand any length of time, is in barrels. Soft, *i. e.*, unrefined, sugars, especially when exposed to the air, get hard more rapidly than granulated. Refined sugars of all the higher grades, such as granulated, cut-loaf, and powdered, not having any moisture in them, can be packed in bags as long as they are kept in a dry place. Coffee sugars, which are the higher grades of yellow sugar, should always be put up in barrels; and unless there is a great advantage to be obtained in buying them in large quantities, they should be bought in small quantities, as required for use, as they dry out and lose weight rapidly. The refined sugars are free from water and undergo no change in condition or weight by being kept on hand. All sugars should be put up in dust-proof packages.

INSPECTION.—When a lot of sugar is to be inspected for acceptance under a contract, the inspector should take with him a part of the sample of sugar upon which the contract is based, and compare it with samples drawn from packages belonging to the lot to be inspected. The method of comparing samples of sugar most in vogue among sugar merchants is to place the samples of sugar alongside of each other on a piece of blue paper, and judge of their quality by their appearance. Granulated sugar of a very fine grain is generally more desirable than that of a coarse grain. Standard granulated sugar has a bright, glossy appearance, and resembles very small pieces of glass.

SACCHARIN is the trade name of a product officially called "gluside," derived from the toluene of coal tar. It occurs as a

white powder composed of irregular crystals, but is usually found in the market in compressed tablets of 1 or 2 grains each. It is very slightly soluble in cold water, more readily so in boiling water or alcoholic solutions. Mixed with about its own weight of bicarbonate of soda it dissolves freely in cold water with effervescence. The sodium compound thus formed is obtained by evaporation and is known as soluble saccharin or soluble gluside. The sweetness of saccharin is similar to that of sugar, but about 300 times more intense. It has no harmful effect on the human system, and has been used by medical men for several years as a substitute for sugar in cases of diabetes or obesity where sweets are desired but sugar or glucose is contra-indicated, Its commercial value at the present time (1896) is about $1 per ounce.

TEA.

Tea, in the commercial sense, is the prepared leaves of the *Thea chinensis* (called *Camellia thea* by some botanists) or tea plant.

The tea plant is a shrub or small tree, from 3 to 6 feet high, with scattered, somewhat leathery, leaves, without stipules. The leaves are from 2 to 3 inches long, and from ½ to 1 inch wide, of oblong-elliptical shape, with transverse, penninerved veins, and are serrated on the edges, except at the base. They are of a shining-green color and have short, channeled foot stalks.

The tea plant is a native of Northern India. The period of its introduction into China, the great tea-producing country of the world, is unknown, but legend and tradition claim that it was in the year 2737, B. C. History, however, makes no mention of its cultivation in China, or the use of the infusion of its leaves as a beverage by the Chinese, until the fourth century, A. D. The tea plant was introduced into Japan from China about A. D. 828.

The cultivation of the tea plant was commenced in Java in 1826, and is now one of the chief industries of the island. In 1840, its cultivation was commenced in India, where it has rapidly extended. The plant was first introduced into Ceylon about 1800, but little attention was paid to it until 1876, since which time its culture has developed with great rapidity.

Of Java, India, and Ceylon teas, it may be said that but small quantities are imported to this country, and that formerly they were inferior in flavor and aroma and would not keep as well as those from China and Japan. This state of affairs, it is claimed, is now changing for the better.

The prepared leaves of the tea plant are generically classified as "green tea" and "black tea." Commercially, teas are classified geographically as China, Japan, India, Ceylon, and Java teas; and these are subdivided into numerous varieties and grades, according to districts of production, form, or quality.

There is but one species of tea plant, *Thea chinensis*, but there are two varieties or subspecies, which are distinguished as *Thea viridis* or the green tea plant, and *Thea bohea* or the black tea plant. While the greater portions of the green and black teas of commerce are prepared from their corresponding botanical varieties, they are so prepared more from custom, convenience, or demand than any other cause, as both of the teas of commerce can, with equal facility, be made from the leaves of either of the botanical varieties of the plant.

The plants are raised from the seed, and, generally, the first crop or picking is made when the plants are three years old. The plants are not generally fertilized, for, while it would increase the yield, it would spoil the flavor of the tea.

In the wild state the plant grows to a height of 15 feet, but the cultivated plants are pruned down until they are only from 3 to 5 feet in height.

In China there are three regular pickings in the course of a year. The first, soon after April 1, is the Shon-Chuen or "Early Spring." This picking is much the finest in quality but limited in quantity, and practically none of it is exported. The second picking, about May 15, is the Er-Chuen or "Second Spring." This is the most important crop and the principal one exported. The third picking, in July, is the Shan-Chuen or "Third crop." It is much inferior in strength, flavor, and quality to the second picking, and much of it is exported and used for blending with the second crop. A fourth gleaning is made in September, called "Old Tea,"

which is retained for home consumption by the poorer classes.

The quality of tea depends upon exactness as to the time of picking it, as a delay of a single day beyond the proper time often changes the choicest leaves into an inferior grade.

The picking is done almost entirely by girls. The average day's work for a picker is from 14 to 16 pounds of raw leaves, which will produce from $3\frac{1}{2}$ to 4 pounds of prepared tea.

The preparation of the tea of commerce consists of the following processes, viz, evaporating, fermenting, sunning, firing, and rolling.

The leaves intended for preparing black tea undergo the same process as those for preparing green tea, except that they are evaporated and fermented for a very much longer period, and are not kept in motion and fanned as constantly. The result is that less of the sap is left in them.

Green teas are of two styles, rolled and twisted, and each of these is, by means of sieves, sorted into two sizes and then graded. The black teas are also assorted according to size and then graded.

When brought to the point of exportation, green teas are often again fired, to evaporate any moisture they may have absorbed in transit, and are then packed into lead-lined, paper-covered wooden chests, which are covered with matting.

There is an erroneous idea, which is quite common, that the distinctive color of green tea is due to its being fired in copper pans. Copper pans are never used for the purpose, but the firing is done in iron pans, paper-bottomed pans, or baskets made of split bamboo. The firing is done over charcoal fires, so as to avoid communicating a smoky odor to the tea.

There are almost endless varieties of green and black teas. The varieties of green tea more commonly purchased by the Subsistence Department are Young Hyson, Gunpowder, Imperial, and Japan; and of the black, Oolong and Congou.

Mo-Yuen produces the best green teas. Nankin Mo-Yuen is the best of all.

Gunpowder is so named from its round, shotty form. Good Gunpowder is small, globular, and granulated in appearance, and is of the earlier pickings. That of the later pickings is larger, more irregular in form, and less delicate in appearance, and produces a darker infusion than that of the earlier pickings.

Imperial is so named because it is used in the imperial household of China. The Imperial which is exported is from late pickings and is inferior to Gunpowder, which it resembles.

Young Hyson and Hyson bear the same relation to each other that exists between Gunpowder and Imperial. The leaves of the finer grades are small and firmly twisted. The infusion made from the finer grades is of a light-golden hue.

Of Oolong, the best grades are from Foo-Chow and Formosa. The leaves of the finer grades of Foo-Chow Oolong are black and crispy, but not brittle, and the infusion is of a dark-golden color, while the leaves of the poorer grades are coarser and more brittle, and the infusion is darker and has less fragrance and flavor. The Formosa Oolong is of a dark greenish-yellow color, the leaves are small and well curled, the infusion is of a bright, clear, golden color, and the aroma is pleasant and pronounced. The infusions of the finer grades improve in taste, and those of the poorer grades get an herby taste as they cool. Unlike all other varieties, the first picking is the poorest and the last the best.

There are two general varieties of Congou or English Breakfast, known as the red-leaf and black-leaf. The latter is generally brought to this country. The best of the latter is the Ning-Chow; this has a small, evenly curled leaf of a grayish-black color, and is often "pekoe-tipped," *i. e.*, it has pekoe leaves, which have a whitish, downy tip, mixed with it. The infusion is of a dark-reddish color, but it has a delicate flavor and a fine aroma.

The finer grades of pan-fired Japan have long, well-curled green leaves, almost like sticks, that uncurl rapidly in boiling water. The infusion has a delicate odor, a clear and bright color, and retains these characteristics until cold.

The principal adulterants of tea are "facing" or coloring matter, "used" or partially spent foreign and inferior leaves, sand, and iron filings.

For facing, Prussian blue, gypsum, kaolin, indigo, turmeric, and China clay are the materials generally used. Facing causes a dirty scum to rise on the infusion, and gives it a greasy appearance and feeling; and, if it is strained, some of the coloring matter will adhere to the strainer cloth, and some of it will pass through it and form a sediment at the bottom of the receptacle.

Tea is sometimes prepared for the market from used leaves by treating them with logwood extract and then facing them. Such tea may be recognized by its peculiar physical characteristics, or by the poor quality of its infusion.

Tea is sometimes adulterated with foreign leaves. The foreign leaves can easily be detected by their botanical features, which differ markedly from those of the genuine tea; and, also, by the peculiar flavor they impart to the infusion. The distinctive botanical features of the tea leaf are regularity of serration, which stops just short of the stalk, and the peculiarity of the veins, which run out from the mid rib almost parallel to one another, altering their course before the border is reached, and turning so as to leave a bare space just within the border.

To Detect Sand or Iron Filings in Tea.—Steep ½ ounce of tea in 8 fluid ounces of boiling-hot water for a short time; remove the leaves and filter through filter or blotting paper; and then examine the residuum with a glass that magnifies from 5 to 10 diameters. If sand or iron filings are present, they will be readily discerned.

To Determine the Quality of Tea by Testing its Infusion.—Weigh out 20 grains of the standard sample and the same quantity of the sample to be tested and put them in separate cups exactly alike in all respects; pour on them equal quantities of boiling-hot water and cover the cups to prevent the aroma of the infusion from escaping; examine them for aroma within half a minute after the water is poured on the samples in the cups, and for flavor, by tasting as soon as sufficiently cool; then let the infusion stand for five minutes for

green teas, eight for Oolong, and fifteen for English Breakfast, when, if there is a disagreeable taste, it will manifest itself.

Broken or dusty teas, or teas with dead leaves, and those that show black, infused leaves, or stalks that float on the surface of the infusion, should not be purchased for the use of the Army.

Teas do not improve with age, but Congou is less impaired by it than other varieties.

Japan teas are put up in packages of from 50 to 80 pounds, net; Congou 65 pounds, net; Oolong from 45 to 65 pounds, net. New-crop Japan teas arrive in the United States in June; Congou in July; Oolong in August; and Young Hyson, Gunpowder, and Imperial in September.

Tea should be stored in a dry place, each kind by itself, separated from every other article from which it might absorb a foreign odor or taste. Opened packages of tea should be exposed as little as possible to the air.

THREAD, COTTON.

The quality of cotton thread is determined by its strength, finish, and color.

Cotton thread should be made of the best quality of raw cotton, and great care should be exercised in twisting and finishing it. It is wound on spools and is put up in cartons containing twelve spools each, and, for Army use, forty-eight cartons are packed in a case.

Cotton thread should be stored in a dry place.

THREAD, LINEN.

The quality of linen thread is determined by its strength, finish, fineness of twist, and color.

The best linen thread is manufactured from the best Irish flax, and will not deteriorate much in strength by being kept on hand for, say, four or five years, provided it is kept in a dry place.

Black linen thread will generally begin to turn brown in about two or three years.

Linen thread is wound on spools, and these are put up in cartons of twelve spools each and packed in cases of any desired size.

THREAD, SILK, BLACK.

To determine the quality of black silk thread it is carefully examined as to color, strength, twist, finish, and weight. The best quality is of a jet-black color, has a smooth surface, and is well twisted and free from knots. It is generally made of the finest quality of Japan or China raw silk. The process of manufacturing and dyeing first-class silk thread is such that, if not unnecessarily exposed, it retains its quality and color unimpaired for a long time.

Black silk thread is put up in cartons of twelve spools each, in sizes A, B, C, and D, which are packed in separate cartons, and, for Army use, forty-eight cartons are packed in a case.

TOBACCO.

PLUG TOBACCO.—Plug tobacco for Army use should be manufactured from the first quality of Kentucky fillers and a fine quality of Virginia wrappers.

The tobacco for the fillers should be ripe, sweet, thoroughly cured, and absolutely free from sand or grit. It should be sweetened to the proper degree with a solution in water of pure, first quality licorice and cane sugar, called "casing." The tobacco for the wrappers should be Virginia leaf tobacco, thoroughly sweated, of a rich, bright, mahogany color, and absolutely free from sand or grit. The plugs should be 12 inches long and 3 inches wide, and should weigh 16 ounces. They should be well manufactured and possess such a degree of moisture that, while being pliable, their keeping qualities shall not be impaired.

Plug tobacco should be packed in boxes of convenient size made from kiln-dried sycamore wood.

Plug tobacco should be stored in a cool, dry, well-ventilated place, and never in a cellar or other damp place.

SMOKING TOBACCO.—There are three general varieties of smoking tobacco, which are made from leaf and plug tobaccos of various kinds, viz, plug-cut, long-cut, and granulated.

Each of the three varieties is cut into strips or granular particles, by means of a machine provided with steel knives, and then sifted. All high grades of smoking tobacco are free from stems. The best quality of smoking tobacco is made from pure Virginia leaf tobacco.

There are many mixtures in the market, made from various kinds of tobacco, to meet the various tastes of consumers.

Smoking tobacco is manufactured at all seasons of the year. Granulated is usually put up for the trade in cloth bags of 2, 4, 8, and 16 ounces each, and packed in cases of from 20 to 50 pounds each. Plug-cut is put up in paper, tin-foil, tin, and cloth subpackages, and is usually packed in cases of 25 pounds each. Long-cut is put up in paper, tin-foil, and tin subpackages, and is packed in cases of 25 pounds each. The best packages and subpackages, for Army use, are as follows: Granulated, in 4-ounce and 8-ounce tins, in cases of 25 and 50 pounds each.

Smoking tobacco should be stored in a cool, dry, place, free from moisture or dampness; should it become moldy, there is no remedy. No particular care is necessary in transportation beyond keeping it dry.

TOMATOES, CANNED.

Tomatoes are the fruit of the *Lycopersicum esculentum* or tomato plant, which belongs to the order *Solanaceæ* or nightshade family.

The tomato plant is a native of tropical America, probably Mexico. It was first cultivated and its fruit brought into use as an article of food in France, where it was called *pomme d'amour* or love apple.

The plant requires a rich soil and an abundance of water for its successful cultivation. It requires to be trained on a wall or trellis. The fruit is a true berry, *i. e.*, it is fleshy or pulpy throughout. It is from 1 to 4 inches in diameter, and is either globose in shape or flattened or depressed at the ends and distorted by large, swelling, longitudinal ridges. The fruit of most varieties, when ripe, is red, but of some it is yellow. It requires a good deal of heat and sunshine to ripen tomatoes thoroughly. In the northern part of the United States, where

the tomato plant is largely cultivated, it flowers from June to August and fruits from August to September.

TO CAN TOMATOES.—There are two methods of canning tomatoes, viz, the cold process and the hot process. The first is used in canning good stock and the second in canning poor stock.

By the cold process, the tomatoes are placed in a wire basket and submerged in boiling water, or steamed, until the skin can be easily removed; the cans are filled, capped, and soldered up, and then processed in a steam drum at 240° F., for eight minutes; they are then vented and the venthole soldered up, and reprocessed for about twenty minutes.

By the hot process, the tomatoes are skinned, as in the cold process, and then cooked in cauldrons, from which they are put into the cans with ladles, and the cans soldered up. They resemble soup and are called "ladle goods."

Leaks are often discovered in cans after they have been processed; they usually occur along the vertical seam of the can and around the edge of the cap, and are easily detected by the presence of extra solder; those on the seams are concealed by the label. Such goods are known to the trade as "seconds."

The season for canning is from August 1 to November 1; those canned earliest are watery, and those canned latest are apt not to be well ripened, while those canned about the middle of the season are the best.

To inspect canned tomatoes, examine as to appearance and taste; then weigh the contents of the can, strain through a colander, and weigh the solid fruit remaining. The weight of the solid fruit varies greatly, being from 50 to 16 per cent of the weight of the entire contents.

Tomatoes are put up for the trade in 2½-pound and 3-pound cans, twenty-four to the case, and 1-gallon cans, six to the case. The 3-pound and the 1-gallon cans are the most suitable size for Army use.

No extraordinary care is required in the storage of canned tomatoes; they will withstand a temperature as low as zero without serious injury. Freezing does not much damage them.

It is not well to purchase newly canned tomatoes during

the canning season or immediately thereafter, owing to the danger of loss from fermentation.

No special care is required in the transportation of canned tomatoes beyond the avoidance of their exposure to very low temperatures.

TONGUE, BEEF, CANNED.

The tongues are, while green, graded according to size, cooked thoroughly, skinned, trimmed closely, and all gullet fat removed. When thus prepared, they are put up in flat, cylindrical cans by a process similar to that for canning corned beef, including the addition of meat jelly. The presence of gullet fat is objectionable, because it readily becomes rancid under favorable conditions.

Beef tongues are put up separately, according to size, in 1½-pound, 2-pound, 2½-pound, and 3-pound cans.

The cans are packed in cases of twenty-four 1½-pound cans, and twelve of the 2-pound, 2½-pound, and 3-pound cans, respectively.

The 2½-pound can is the best for Army use.

The same care in storage and transportation should be observed as in the case of canned corned beef. It has good keeping qualities.

TOWELS.

The following kinds and varieties of towels are kept by the Subsistence Department, for sale to officers and enlisted men of the Army, viz:

Linen damask, about 50 inches long and 26 inches wide.

Huckaback, No. 1, about 40 inches long and 20 inches wide.

Huckaback, No. 2, about 42 inches long and 21 inches wide.

Bath, cotton, about 42 inches long and 24 inches wide.

Bath, linen, about 63 inches long and 24 inches wide.

Wash, cotton, about 14 inches long and 12 inches wide.

Damask Towels.—To determine the quality of damask towels they are examined as to the fineness of thread, weight, size, bleaching, and closeness of weave. The finish of the threads is examined with a magnifying glass, which will show any imperfections in the twist.

The damask towels kept by the Subsistence Department are 50 inches long and 26 inches wide, and the weight of twelve towels is 5 pounds. They are of a very fine quality, and have ends of knotted fringe, well tied.

The commercial case contains from 150 to 200 subpackages of 1 dozen each, and, on account of its large size, is not a suitable package for Army use.

Packages for Army use should contain not exceeding 144 towels each, or 12 subpackages.

BATH TOWELS, COTTON.—The yarn used in making these towels is made from good, long-staple, well-seasoned Georgia or Carolina raw cotton. Yarn is spun of the requisite strength, firmness, and twist; it is then woven into bath towels on Terry's patent power looms, by a particular system which insures superior absorbent quality combined with durability.

The towels are bleached with extra care, using artesian-well water, and drying with a centrifugal machine and in a steam-heated room. They are 42 inches long and 24 inches wide, and twelve towels will weigh 8 or 9 pounds.

The commercial-size package contains from 15 to 20 dozen, which is too large for Army use. The most desirable package for Army use is a repacked case containing only forty-eight towels.

In the inspection of these towels they are examined as to their weight, the size and twist of the yarn of which they are made, and the quality of the weaving.

TOWELS, BATH, LINEN.—These towels are made of the best Irish flax, in or near Manchester, England. They are brown, rough towels, 63 inches long and 24 inches wide, and twelve of them will weigh 12¾ pounds. They are packed in cases containing about 50 dozen.

The most desirable packages for Army use are repacked cases containing forty-eight towels each.

All cases containing towels should be made of clear boards, free from knots, as knots are liable to fall out and permit the entrance of mice.

TOWELING.

Two kinds of toweling are kept for sale to officers and enlisted men of the Army, viz, bleached and unbleached.

The quality is determined by the class of yarn used, the size and finish of the threads, and the bleaching.

Toweling is made of Scotch or Irish flax, and is put up in bolts containing 25 or 50 yards each.

The dimensions and weights for Army use are as follows: Bleached, in bolts of 25 yards, is about 19 inches wide and weighs 5½ pounds. Unbleached, in bolts of 25 yards, is about 20¼ inches wide and weighs 6¾ pounds.

VINEGAR.

Vinegar is the common name applied to a dilute and somewhat impure solution of acetic acid, used as a seasoning in making sauces, salads, etc., and as a preservative in making a great variety of pickles.

The alcoholic liquor formed by the fermentation of the juice of grapes or other fruits becomes sour on exposure to the air and is readily converted into vinegar. When dilute alcohol is treated with yeast it absorbs oxygen, water is split off, and a very unstable compound, aldehyde, is formed, which oxidizes readily and forms acetic acid or vinegar.

In the so-called "quick" process the oxidation of the dilute alcoholic liquor is hastened by allowing it to trickle through shavings already saturated with vinegar, the temperature being maintained at about 90° F.

In the United States the alcoholic liquors used are chiefly whisky (diluted with eight or ten times its bulk of water) and low wine.

Tall tubs or vats, sometimes 20 feet high, with perforated bottoms, called generators, are filled with clean beech shavings, well packed; these are first soaked with strong, hot vinegar, then the diluted alcoholic liquor is poured in a small, continuous stream upon the top of the shavings, whence it trickles down slowly through them to the bottom, where the oxidized liquor or vinegar is drawn off. Whisky can thus be converted into vinegar in twenty-four hours.

Vinegar made from good apple cider, by a good process, is the best for table use.

Formerly, most of the vinegar used in the United States was cider vinegar, and it is still used to a considerable extent.

To Make Cider Vinegar.—Partly fill barrels with cider, add a small quantity of vinegar or mother-of-vinegar, leave the bungholes open, to allow the free entrance of air, and keep the temperature of the storeroom at or above 75° F. In about six months the contents of the barrels will have turned into vinegar.

Beer, malt, glucose, artificial, and wood vinegars are all objectionable, and should never be purchased for Army use.

Vinegar is frequently adulterated with other acids, such as sulphuric and muriatic, but no matter how small the mixture, or the caution used, they are readily detected.

The formulas of acetic acid and its adulterations are as follows, viz: Acetic acid, $C_2H_4O_2$; hydrochloric acid, HCl; sulphuric acid, H_2SO_4; and nitric acid, HNO_3. A comparison of these formulas shows that the acetic acid is derived from alcohol, and that it is organic, while its substitutes are inorganic.

From the foregoing it is obvious that, in examining a sample of vinegar, the first consideration should be toward the detection of foreign acids; and if these are present beyond a mere trace that might possibly come from the water or from the receptacles containing it, the sample should be rejected.

Methods of Examination.—1. Half fill a test tube with vinegar, add a small crystal of barium chloride, and if sulphuric acid is present, the barium chloride will be precipitated as a sulphate.

2. Half fill a test tube with vinegar, add a small crystal of silver nitrate, and if hydrochloric acid is present, the silver will be precipitated as a chloride.

3. Nearly fill a test tube with vinegar and sulphuric acid, one and one, being careful to pour the sulphuric acid on the vinegar, and not the vinegar on the acid; cool the mixture and add, cautiously, along the side of the test tube, a few drops of ferrous sulphate, so that the fluids will come in contact, but not mix; if nitric acid is present, the stratum of contact will show a purple or reddish color, which changes to brown. If the fluids are then mixed, a clear brownish-purple liquid will be obtained.

THE BRUCINE TEST.——To a few cubic centimeters of vinegar in a test tube add four or five drops of brucine, and then a few drops of concentrated sulphuric acid, and if nitric acid is present, a red color will be developed.

TO DISTINGUISH CIDER VINEGAR FROM SPIRIT VINEGAR.—Place a weighed quantity of the sample to be tested in a porcelain dish and evaporate it at a temperature of 212° F., until constant; the residuum should be, for cider vinegar, not less than 2 per cent, and should be from a clear light-brown to a dark-brown color, soft, viscid, and hygroscopic; and, when burned, should give off the odor of burned apples. A lead-acetic solution will cause an immediate light yellowish-brown precipitate in cider vinegar, the precipitate settling, usually in flakes, in less than five minutes.

TO DETERMINE STRENGTH.—In using Twitchell's acidimeter, it should be remembered that the 45° mark thereon is generally about equivalent to the chemist's test of 35 grains of potassium bicarbonate neutralizing one fluid ounce of vinegar.

The quantity of potassium bicarbonate or of sodium bicarbonate necessary to neutralize the acetic acid contained in a fluidounce of vinegar of 1 per cent strength is as follows: Potassium bicarbonate, 7.42 grains; sodium bicarbonate, 6.23 grains. These quantities increase in direct proportion as the percentage of acid increases; thus, to neutralize a fluid ounce of vinegar of 4½ per cent strength requires 33.39 grains of potassium bicarbonate, or 28.03 grains of sodium bicarbonate; and of 5 per cent strength, 37.10 grains of the former, or 31.15 grains of the latter, respectively.

Vinegar for Army use should contain from 4½ to 5 per cent of acetic acid.

If flies or eels are in vinegar, they can be readily detected by the microscope. They are easily destroyed by raising the temperature of the vinegar to 212° F.

Vinegar for Army use should be put up in iron-bound oak barrels, painted red, and the bungs capped with tin.

Vinegar should never be exposed to a freezing temperature.

APPENDIX.

NOTES ON CANNED GOODS.

SOLDERED-UP HOLES IN TOPS OF CANS.—The process of canning articles of food involves the making and soldering up of two punctured holes in the top of each can, and therefore has no bad significance. The presence, however, of *three* soldered-up punctured holes in the top of a can is indicative of "reheating," *i. e.*, of the can having in the first instance failed to stand the "vacuum test," and that, to remedy this defect, it has been returned to the process tank, reheated and again vented and the venthole soldered up. Reheated cans are more likely to spoil than those that are perfectly processed in the first instance, as decomposition may have set in before they were reheated. Owing to the aforesaid objections to reheated cans canners who reheat cans are careful to make the third puncture as inconspicuous as possible, and frequently endeavor to conceal it entirely by making it on the side of the can near the top, under the lid, and pasting the label over it. By running the finger around the rims of a can it is easily determined whether it has a third soldered-up hole or not by the presence or absence of a small lump of solder.

REPROCESSING.—Sometimes newly packed cans of food are so much swollen that reheating would not be adequate. In such cases the cans are opened and emptied and the contents picked over and the unsound parts thrown away. The sound parts are then repacked into cans, which are subjected to the same process as in the original canning, and these operations are called "reprocessing." Reprocessed cans have only two soldered-up punctured holes in them and otherwise have the same external appearance as regularly packed cans, and their defective quality can be determined only by opening them and examining their contents, which will present an overcooked appearance.

Reprocessing is rarely resorted to, because its cost leaves little, if any, margin of profit for the canner.

QUALITY OF TIN.—The tin used in making cans should be of the best quality, and the solder should be carefully applied on the outside of the cans only, so as to prevent its coming in contact with the contents. The corrosive action of the contained fruits, etc., on the tin of the cans produces crystalline figures upon their inner surfaces which are suggestive of tin in solution being taken up in injurious quantities by the food in the cans.

EFFECTS OF AGE.—*The American Grocer* says editorially: "The popular idea is that canned or preserved food should be judged by the standard set up for fresh food, on the ground that 'the fresher things are the better.' As a general proposition, this latter idea is correct, but as applied to canned goods it is erroneous and misleading. It is frequently the case that goods put up during the latest season are very inferior to the same sort of goods put up three, five, or more years earlier. The character of seasons varies from year to year. Thus, in a season of excessive moisture, peaches contain much more water than in a season of ordinary climatic conditions. From this it is evident that the quality of peaches and other fruits varies from year to year, rendering it possible for the older goods to be better than the newer. Some fruits, as for instance, pineapples, are better the second or third year than the first, because it takes time for the sirup to thoroughly permeate the fruit. The same is true of many acid fruits, which, when first packed, are a little hard but which become mellow with time and the absorption of the sirup. Age works no harm to canned goods. If properly put up they will keep indefinitely, as claimed by Appert, the discoverer of the process, in 1807. This has been proven by the tests of eighty odd years."

THE EFFECTS OF COLD.—With respect to the effects of extreme cold upon canned goods, Brig. Gen. A. W. Greely, Chief Signal Officer, U. S. Army, says.

"You ask me to state the effects of freezing upon canned fruits and vegetables, especially as regards the texture and

flavor of tomatoes, corn, etc. Apples, peaches, pears, rhubarb, green peas, green corn, onions, potatoes, and tomatoes were all subject, at Lady Franklin Bay, to extreme temperatures (over 60 degrees below zero), and were solid for months at a time. The second summer they thawed, and the following winter froze solid again. All the articles named presented the same appearance as though freshly canned, and their flavor was as good when the contents of the last can were eaten as in the first month. It should be understood that these were first-class goods and from dealers of standing and reliability. Cranberry sauce, preserved peaches, and fruit butters suffered certain changes from candying, etc., which detracted somewhat from their flavor, though not materially so. Dealers in such preserves predicted that such conditions and changes would occur. I had also canned turnips, squash, beets, and carrots, as well as pineapples, cherries, grapes, clams, shrimps, and crabs, which, although not subject to such extreme temperatures as the foregoing, yet froze and thawed repeatedly without injury. No can of any kind, except a few, say half a dozen of fruit butters, was ever burst by the action of cold or heat."

Tests by Freezing.—An officer of the Subsistence Department while stationed at St. Paul, Minn., in the winter of 1876–77, exposed a few articles of subsistence stores to a temperature of 10° F. below zero, thawed them out in a few days, examined the contents, and reported as follows, viz:

"None of the cans burst and no signs of the starting of the solder could be discovered. The tomatoes were not apparently changed in any respect by freezing. The peaches were softened, their texture being somewhat ruptured. The asparagus was rendered flat and insipid, and the green peas, while to the eyes were unchanged, still their flavor was impaired. Vinegar in kegs or barrels, if frozen, is liable to burst the barrels, and on thawing is found to be unchanged in properties. Olive oil is not injured by freezing. Good extracts have pure alcohol without water in them and can not freeze at any temperature found within the limits of the United States. Throughout the Department of Dakota, in winter, fires are

kept up night and day in the subsistence storehouses at all posts. The long-continued cold weather of that climate would freeze solid everything and break all bottles and start all cans whose contents were largely fluid and nearly filled the can to the top. Water expands 0.089, nearly $\frac{1}{11}$ in volume, on freezing. Water, in canning, from 39.83°, its greatest density temperature, to 212° F., the boiling point, level of the sea, expands 0.4012 in volume; from 72° F. to 212°, it expands 0.03832. In processing cans that are filled with juice, like tomatoes, for instance, an expansion of 0.03832 takes place. A gallon can contains 231 cubic inches; its contents expand 8.85 cubic inches in processing, and this percentage of the contents is lost by passing out through the vent. A 3-pound can holds about a quart; therefore loses of its contents about 2.213 cubic inches. We may then regard that a processed can (3-pound) after returning to the temperature of the atmosphere (72° F.) to have a vacuity of 2.21 cubic inches, which can be filled up without injury to the can by a moderate freezing of the contents; but when they are frozen solid, the expansion is equal to 5.15 cubic inches, which would most likely rupture the tin or start the solder."

In order to secure more extended, complete, and satisfactory results, obtain full knowledge on the subject, and establish a reliable basis, the Chief Commissary, Department of Dakota, was instructed by the Commissary General of Subsistence, in January, 1896, to experiment with various articles of subsistence stores by exposing them to extremely cold weather and to report the results.

Taking advantage of a very cold snap on February 19, 1896, which reached 19° F. below zero, the stores were exposed until February 21, during which time they were subjected to a varying temperature, which, however, did not rise above 3° F., and every article was frozen solid; they were then removed to a cool cellar where they remained until June 20, 1896, when they were examined and compared with similar articles of the same brand that had not been frozen.

The report of the result of the experiments states:

"This examination and comparison very clearly established the fact that when moist food had been frozen solid and was

thawed out, a permanent chemical change had taken place. Not so great a change, perhaps, as if subjected to boiling heat, but still a change; and this was particularly noticeable in goods which contained acid, sugar, and salt. Sometimes the change in taste and appearance was so slight that it would not have been noticed except by comparing with goods which had not been frozen. None of the cans containing the frozen goods were cracked or had the solder started; and the can heads which had been bulged by freezing had entirely subsided. This examination was only as to general results; the exact determination of change or deterioration could only be ascertained by a practical chemist. Another noticeable thing about this examination was, the freezing and thawing of the goods did not cause any perceptible fermentation."

The following is the result of the experiments in detail:

Pork.—Was frozen in brine; could not detect any difference in taste or appearance even when cooked.

Bacon.—Moisture and salt were drawn to the surface; tasted drier and less salty.

Corned Beef.—Could not detect any difference in taste or appearance.

Dried Codfish.—Moisture and salt drawn to the surface; tasted drier and less salty.

Pickled Mackerel.—Frozen in brine. Somewhat softer and less salty.

Tomatoes (cans).—Flavor slightly impaired.

Molasses (cans).—Color somewhat darker and less flavor.

Vinegar (keg).—Slight loss of acidity.

Apples (cans).—Flavor considerably impaired. and pieces had a more ruptured and mushy appearance.

Apricots.—Pieces somewhat ruptured and flavor slightly changed.

Creamery Butter.—Was frozen in brine. More musty to taste than the sample not frozen, and it was also whiter in appearance.

American Cheese.—More granular in appearance and flavor changed.

Green Corn.—Softer, sweeter to the taste, and had lost its freshness.

Crabs.—Softer, and flavor changed.

Flavoring Extract, Lemon.—Did not freeze or have cork started, but flavor seemed slightly less fresh and strong.

Flavoring Extract, Vanilla.—Did not freeze or have cork started, but flavor seemed less fresh and strong. When subjected to lowest temperature, it was slightly congealed.

Sugar-cured Ham.—Moisture and salt drawn to the surface. It was found very moldy, which destroyed its flavor. Had the cover been removed after it was frozen, it might not have been so moldy.

Blackberry Jam.—Less firm and flavor slightly changed.

Currant Jelly.—Less firm and flavor slightly changed.

Lard.—Could not detect any difference in looks or in taste, even when cooked.

Lobster.—Flavor slightly changed.

Milk.—Sugar more crystallized.

Mushrooms.—Less fresh to the taste.

French Mustard.—Cork started at 12° below zero, but could not detect any change in flavor.

Olive Oil.—Bottle not broken or cork started. Could not detect any difference. When subjected to lowest temperature it was congealed.

Oysters.—Pieces somewhat ruptured and flavor changed.

Peaches (cans).—Pieces not so firm and flavor slightly changed.

Pears.—Slight loss of flavor and pieces not so firm,

American Peas.—Less firm and slight loss of flavor.

French Peas.—Slight loss of flavor.

Gherkin Pickles (Gedney's).—Bottle was broken at 14° below zero (Fahrenheit). Contents soft, but possibly the cause of this softness was the exposure to the atmosphere after bottle was broken.

Chowchow Pickles (Heinz's).—Cork started at 12° below zero (Fahrenheit), but could not detect any change in flavor.

Fresh Pigs' Feet.—Less fresh in taste.

Pineapple.—Pieces somewhat softer and had less flavor.

Preserve, Damson.—Could not detect any difference in looks or taste.

Salmon (cans).—Less fresh in taste.

Sardines.—Less fresh in taste.

Cranberry Sauce.—Flavor slightly changed.

Worcestershire Sauce.—Cork started at 10° below zero (Fahrenheit). Less strength and freshness in taste, but this may have been partly caused by exposure to atmosphere after cork was started.

Shrimp.—Somewhat drier and a slight loss of flavor.

Chicken Soup.—Could not discover any difference in appearance or flavor even when cooked.

Beef Tongue.—Could not detect any difference.

Toilet Soap (*American Glycerin*).—There was no difference.

Black Ink (*Thomas's*).—In paper bottles. The bottle had leaked, but no difference in color or writing quality was perceivable.

When canned or bottled goods have become frozen they should, if possible, be kept in that state till required for immediate use. By immersion in cold water, they can be restored to nearly their original condition.

EFFECTS OF HEAT.—Surg. Maj. W. Simpson, M. B., British Army, says:

"Taking my experience in India and the late Nile expedition, in which the test of tinned provisions was exceptionally severe from continual exposure to the powerful direct rays of the sun, I have found that tinned provisions, meat, and vegetables, put up separately, or combined in the form of soups, are practicably undamageable by any climatic heat, provided the following conditions are carried out:

"1. Provisions to be of best quality.

"2. To have received the proper amount of cooking before the tin is closed.

"3. To be put up *in vacuo* in perfectly sound, air-tight tins.

"The only class of provisions that, in my experience, suffer from great heat is that of uncooked articles, such as butter, cheese, and some forms of potted meats. Of course, once the tin is opened, the contents last much longer in cold than in warm weather, and last better in hot, dry weather than in hot, moist weather. In this last case the provisions must be used immediately."

NOTES ON INSECTS.

Insects are small, metamorphosic animals having, with rare exceptions, four distinct states of existence, viz, (1) the ovum or egg, (2) the larva or caterpillar or maggot, (3) the pupa or chrysalis, and (4) the imago or beetle or adult.

The following are the principal insects that are destructive to articles of subsistence stores, viz:

1. The *Dermestes lardarius* or bacon bug. It is very destructive to bacon and all other kinds of dried meat. This insect, while in the imago or beetle state, deposits its eggs on bacon or other dried meats, and from these the larvæ are hatched. As soon as the larvæ are hatched they commence their ravages upon the meat. When full fed, they change into the pupa or chrysalid state, and from that, in due time, into the imago or beetle state. The beetles are about ⅛ inch long, and are of a dusky-brown color, except the upper half of the wing cases, which are of a whitish or ash color. These insects, when in the larva and pupa states, are so concealed in the meat that they can not be effectually removed from it, but upon attaining the imago state they are no longer concealed, and may be readily removed and destroyed.

2. The *Dermestes vulpinus* or hide bug is similar to the bacon bug.

3. The *Musca vomitoria* or meat fly is about ½ inch long, and has a thick, hairy body of a black color, except the hind part, which is of a shining blue color. These insects are remarkable for their extraordinarily powerful sense of smell. They scent meat from long distances and come in swarms and deposit their eggs, commonly called flyblows, upon it. A piece of meat is never secure from their attacks unless it is well covered. These flies frequent meat shops, kitchens, and pantries. The period of their metamorphoses is very short, only about four days from the larva to the imago state; and hence their great fecundity. Among subsistence stores, they are most likely to attack fresh beef.

4. The *Calandra granaria* or grain weevil is about ¼ inch long, without wings, and varies in color from a dark chestnut to pitch black. These weevils make their appearance in April or May, according to the climate, and continue their